THE

MONTHLY JOURNAL

OF THE

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

Vol. I. October 1842. No. III.

Correspondence regarding the growth, varieties, culture, crossing, and productiveness of the different kinds of Cotton known in commerce; with suggestions, as to the means of turning our knowledge of these, to the best possible advantage in India.

FROM J. V. THOMPSON, ESQ. M. D. F. L. S. DEPUTY INSPECTOR-GENERAL OF HOSPITALS AT SYDNEY, DATED SYDNEY, AUGUST 24TH, 1841.

To the Right Hon'ble the Earl of Auckland, Governor General of India.

[Presented to the Society, by the Earl of Auckland.]

MY LORD,—Perceiving the intense interest taken by the Government in India, and at home, in the advancement of the Agriculture of India, particularly the principal objects of tropical Agriculture, and more especially Cotton; I have taken the liberty of addressing your Lordship, in furtherance of those philanthropic views, conceiving that I possess practical information, that may be of essential service to the success of the experiments and efforts now in progress. Being a member of the Agricultural and Horticultural Society of India, I had intended submitting some observations to that body, but being aware, that the Government have taken upon itself the

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conduct of the present efforts to extend and improve the Cotton culture, I judged that it would be better to submit these observations direct to the Government.

Your Lordship is no doubt aware, of the vast extent and importance of the Cotton trade in all its branches; which, according to the American Almanack of 1837, gives to England, manufactures comparatively valued at two-thirds of all her public revenues, and nearly equal to all her exports of other articles—giving employment in the United Kingdom to 200,000 persons. Your Lordship is further informed of the disproportionate share the Americans enjoy, of the importations of the raw material, viz. in 1835, for example, 763,199 bales; while India only supplied 117,965, being a balance in favor of America of 645,234 bales. As an American war is by no means an unlikely contingency, an almost total stop must in that case be put to this branch of industry, and of revenue; and, as the stock on hand is never more than sufficient to supply the consumption for above three or four months, the distress and embarrassment that would necessarily ensue, if continuous for any time, would go near to produce a national bankruptcy: it is therefore the interest of Government and of all persons connected with this trade, in ever so remote a degree, to assist in every plan, that has for its object, the transferring of this vast and lucrative trade in Raw Cotton, to our own possessions.

In looking around, I can see no field so promising as India, where a very inferior Cotton has been pretty extensively sown, and largely cultivated, but not in proportion to the abundance of land capable of producing one or other of the varieties of a superior Cotton, and of the abundance of cheap labour.

That the natives of India should have continued to cultivate so insignificant a plant, and inferior a Cotton, is somewhat paradoxical, as all the varieties of the Gossypium herbaceum of Dr. Roxburgh,* or Indian Cottons, are puny,

* See specimen of cotton and pods herewith sent.

unproductive, and require great labour to separate the wool from the seeds, which is short and in general not remarkable for its fineness, and hence it carries the lowest price of all the Cottons of commerce.

The efforts that have hitherto been made to assist the Natives to cultivate a superior Cotton, more productive and valuable, appear to me to have been trifling, in proportion to the great importance of the object, those at present in progress being perhaps the best concerted and comprehensive that have been made. They are however, I fear, still too limited and imperfect to promise the success that could be wished. I would by no means stop at the introduction of a more productive Cotton, as the Upland Georgia*, which only yields a remunerating price, a little above the Cottons of India, but I conceive that efforts ought to be directed to produce *a long stapled* Cotton of various quality, separating easily from the seeds, which would undoubtedly supersede the *short* stapled Cottons of India and America, and which can scarcely be made useful in our manufactories without a due admixture of some *long* stapled Cotton. Many of these Cottons, while they are equally productive, are *double* the price of the Indian, and a third more than the best Georgia.

In making a proper selection however, it would be improper to be guided by the price alone, as there are peculiar characters and circumstances, which experience alone is capable of pointing out. These are partly to be ascribed to the plant, and partly to the climate. I regret to say that we are very deficient in information upon this subject, and planters have known, and are alone capable of communicating, a knowledge of the peculiarities of the varieties, cultivated in their own locality, which generally, as in America, consists of two or three at most.

* See sample of pod.

From the observations I have been enabled to make in the course of my service in various colonies, and having had, this present season, upwards of thirty varieties of Cotton under culture in a very small way, I have discovered, what, by a wrong choice, might involve a planter in difficulties, and might lead to such disappointment in a Native of India, as would give him a distaste for any further experiments. This I must entreat your Lordship's patience to explain. The cultivated varieties of Cotton, I find, may be divided into two classes, viz. early and late kinds; this precocity or tardiness being inherent in the particular variety, and derived from a peculiarity hitherto unnoticed, and which it will not be difficult to explain. It may be observed, that all the varieties have a natural tendency to produce a central main stem, furnished with a leaf at intervals of a few inches; in the axillæ of each leaf-stalk reside a *pair* of germs or buds, placed in the same plane or side by side; one of these germs is destined to produce flowers only, the other only branches. In the *early* kinds, the former or flowering branches alone are developed, while the *late* kinds expend their force exclusively in the production of multiplying branches. This peculiarity must for ever unfit these late kinds for a cold climate, such as Northern India, North America, Europe or the settled parts of Australia: as just when the plants begin to develope their *secondary* flowering branches, which they do first towards the summits of the main stem and multiplying branches, the cold season comes to check them, so that they rarely ripen a single pod; and if the temperature falls much below 70° F. the greater number of these varieties are killed down to the very ground, or entirely destroyed. Should the climate prove sufficiently mild, or the plant so hardy as to withstand the effect of the cold season, it may be expected that these late kinds would by the advance they have already made, yield an early crop of Cotton, the second season. When these kinds are planted in a hot

climate, to which alone they appear to be adapted, they may yield a comparatively small crop within the first twelve months. It is very important therefore to become acquainted with these late kinds, and to avoid the cultivation of them altogether, when it is an object of the planter, to secure a good and certain crop within the first year.

The kinds I have discovered as belonging to this class are—

1. The kidney-seeded or Brazilian cottons.

2. The vine-leaved cotton from St. Helena*.

3. The maple-leaved cottons, viz.

The Seychelles.

The Mangrole.

4. Dacca, and the other varieties of Dr. Roxburgh's Gossypium Herbaceum.

5. Some varieties of Bourbon.

The kinds of the class, which my knowledge and experience point out as the best, and least likely to disappoint the expectations of Government, are—

1. The ordinary Sea Island†; the seed sold in America at the rate of a dollar for forty bushels.

2. Select Sea Island.

3. Extra-fine in small quantity.

4. Bourbon (if to be got,) ordinary‡, and fine (not the Bourbon of India which Dr. Roxburgh says is the Gossypium Barbadense.)

5. West Indian, perhaps inclusive of Demerara.

6. Egyptian Maho, and other early varieties of Egyptian.

To these may probably be added some of the varieties of Burmese or Siamese cottons as reported to have been brought by Dr. Wallich from the coast of Martaban to the India House, and as cultivated also in the interior, according to Colonel Symes and Major Burney, and which, from the facts they

* See sample of leaf. † Sample herewith. ‡ Sample herewith.

have communicated, may be inferred to be an early kind, with a long fine staple, easily separated from the seeds.

Under this conviction, I would beg leave respectfully to urge your Lordship, most strongly to take measures to procure a very ample stock, against next season, of Burmese Cotton seed, (enough to freight a vessel) from Chagaing or Lettshoung-yoo near Ava, the chief emporiums of Cotton on the Irawaddy, as it is to be had in unlimited quantity, at an exceedingly trifling cost. At the same time I would recommend some seed to be procured of a foreign variety of Cotton, cultivated to some extent, according to Major Burney, by the inhabitants of Taroup-Myo*, a place on the Irawaddy a little below Yandaboo. This Cotton is designated by the Natives Themban-Wa or ship Cotton; it is to be observed however, they call the Pernambuco Cotton by the same name, of which they appear alone to have a few plants, but the seeds of the Pernambuco are very easily distinguished, by their adhering together in lengthened groups, or more precisely in conical masses of from about 7 to 9 seeds.

I have to apologize to your Lordship for this hurried and imperfect sketch, as I find I must conclude to save the present opportunity, in order that so much of my experience may accompany a box of samples already shipped on board the Herald. Should the vessel not sail for a day longer, I shall be enabled to continue the subject, and to bring it to a more complete and satisfactory conclusion.

In the mean time, I should be most happy to co-operate in any way in the success of the experiments now in progress, by receiving and multiplying the most desirable varieties of long stapled Cottons, and returning the produce in seed, should any stock remain on hand of the late importations, as

* See Transactions of the Agricultural and Horticultural Society of India, Vol. ii. p. 124-7.

these might be sown *here* as late as Christmas; or by being entrusted with a commission to obtain Bourbon or Sea Island seed, for which the trade here offers many facilities.

Sydney, August 25th, 1841.

My Lord,—In continuation of my communication of yesterday, I beg to say, that the point next in importance to the choice of the kind of Cotton, is climate; for as all the varieties are natives of warm climates, even the hardiest of them can only be got to grow, so as to produce a remunerating crop within a belt limited to the 40° of northern, and 30° of southern latitude, these appear to be about the extreme limits at the level of the sea; elevation as it lowers the temperature according to known laws, will of course reduce their limits considerably in a mountainous country, and render necessary, that this should be determined with some degree of precision, before engaging in a culture that might prove abortive, from the temperature proving to be below the required standard.

As a general rule it may be stated:

1st. That none but the *early* kinds can be successfully cultivated in extra-tropical countries, or at elevations in which the temperature does not permit a *continuous* vegetation of nine months; or, in other words, where the temperature is not steadily at or above 70° of Fahrenheit's thermometer, during the above period.

2nd. In tropical countries every variety of Cotton may be cultivated, unless at great elevations, and may be advantageously made a *perennial* crop.

The third point to be considered in cultivating Cotton is the soil, and my experience enables me to say, that the greater number of the varieties, may be cultivated in soils too poor and scanty to produce a crop of almost any other plants; as with the exception of meagre dry land, stiff clay, or boggy

ground, it adapts itself to every description of soil. I have seen it luxuriating in almost pure sand, and amongst the almost bare *volcanic* rocks and stones of the Mauritius.

Should the prejudices of the Natives, cause them to reject the cultivation of a plant with a new face, and so different from what they have been accustomed to; it has appeared to me that this difficulty may be obviated (should it present itself) by crossing the native varieties, with Cottons possessed of greater productiveness, longer staple, and easier separation of the seeds, as I think that I have discovered in my experiments conducted with this view, that the plant receiving impregnation affords a progeny, still partaking more of the appearance of the mother, while the principal change is effected in the pod, seed, and Cotton.

Having experimented in crossing to a very great extent this season, I could have sent your Lordship some of the resulting seed, but sensible that it is now too late for India, I shall sow it in a few weeks time, and communicate the result in a future paper. As illustrative of what is above stated on this subject, I have sent a sample of a much improved crop of Georgia with Maltese Brown, which I designate Georgia-tinta, and forms a Nankeen Cotton, which separates more easily from the seed than Georgia, and is converted into a *long-stapled* wool of superior quality, while the plant is to all appearance unchanged. To show that the tint is not inherent, but capable of being discharged by bleaching, I have enclosed a small sample so treated, which has become beauti*fully white, without having been injured in staple.*

I have also sent some samples of a new Cotton* of very superior quality, but mostly tinted, together with small bleached samples of the same, to show that these tints are readily discharged, but with danger to the strength of the staple, if not cautiously conducted, as these samples exemplify.

* Sirica and Persica.

Sydney, August 27th, 1841.

MY LORD,—The vessel about to sail for Calcutta having been delayed, enables me to send, in addition to my former communication, four small packages of my crosses of Cottons, the produce of this last season. The improvement that may have been effected, must be left to be ascertained by careful cultivation. I have no doubt but they have received impregnation in various degrees, and it would therefore be desirable to avoid distributing them, until the character of each individual plant has been ascertained. Every seed of these I consider invaluable, from the pains that has been taken with them in this untoward climate, and from their having for object the improvement of the Indian and the Upland Georgia Cotton, the culture of which appears to be so. much advocated by many members of the Agricultural and Horticultural Society.

I have altogether, the result of my experiments in crossing, this season about thirty different kinds, and I think it may prove interesting to your Lordship, and useful to others wishing to tread in my steps, to be acquainted with the mode I have pursued in effecting the requisite impregnation.

I was naturally conducted to this mode of obtaining improved Cottons, by observing the facility or rather aptitude with which the Bourbon Cotton received impregnation, without artificial assistance; as, having been introduced by Mr. Mayo, together with many other kinds, about seven or eight years ago, it has now run into as many distinct varieties as it has been years in the colony!

My plan, systematically conducted during the past season, has been to sow an open drill of the superior kind, at five feet from plant to plant, and a drill, on each side of it, of the kind to be improved. As these came into flower daily, I went over the two outer drills, cutting entirely away the stamina with a pair of Surgeon's crooked scissors, observing to hold the opened flower steadily with the left hand, and using the scissors with the elbow or bend *outwards;* in this way it is easy to see

clearly down to the bottom of the drill and avoid injuring the stigmas. In most Cottons the stamina stand out from the central column so freely that it is very easy to cut them away; in the East India Cotton it is more difficult, from the stamina being so short and close set. In these, however, and in the Sea Island Cotton they are arranged in five longitudinal rows, and may generally be entirely removed by five distinct clippings; if any still remain, they must be taken away by the point of the scissors. In all the kinds, except the Indian, the stamina never require to be blown out of the flower from its erect position; but in the Indian, all that is requisite, is to let the flower drop into its original pendant position, and to tap it gently with the fingers. As the pollen of all the malvaceous plants is globular and hairy, and apt to adhere to the stigma, it is better finally to brush it off the denuded stigma with a full sized camel-hair pencil. When all the flowers intended to be impregnated, are thus prepared, the next operation is to load a dry and full-sized camel-hair pencil, with the pollen from some of the flowers of the central drill, and to apply it in succession to the denuded stigmas, so as to charge them with an abundant coat, occasionally replenishing the brush from fresh flowers. When one kind only is under experiment, all that is necessary in addition, is to cut away all flowers that have not received impregnation; but as my operations have been upon a very extensive scale, I find it necessary to mark every impregnated flower by tying a small piece of coloured worsted (silk fades) round the peduncle or flower stalk.

The change which it is to be expected, will have been produced in those now sent to your Lordship, will be in the greater length and fineness of the staple, and in its more easy separation from the seeds; it is farther probable that the Indian plant may be somewhat changed, by becoming more robust, earlier and more productive.

SPECIMENS AND SAMPLES SENT IN A TIN BOX ADDRESSED TO THE GOVERNOR GENERAL AND PLACED ON BOARD THE HERALD, VIZ.

1. Specimen of India Cotton Shrub.

2. ——— of two acclimated pods of ditto.

3. Leaf of a new kind of Cotton, which I call *Serica.*

4. A pod of ditto.

5. Wool of ditto.

6. Bleached wool of ditto, injured in staple by the strength of the bleaching liquor.

7. White Serica, wool of a variety with a carnation-tinted staple.

8. Persica, a black-seeded variety of the same; perhaps the finest of all.

9. Ditto, bleached wool, also injured in strength by the too great force of the liquor.

10. Georgia-tinta wool, of a cross between Georgia and brown Maltese; the wool is converted into long staple, with easy separation, and is much improved in quality.

11. Ditto bleached, but without the staple being weakened or injured, showing that the tint is readily discharged.

12. Pod of ordinary acclimated Georgia.

13. Two Pods of Mangrole Cotton.

14. Seeds and wool of acclimated Bourbon.

15. Ditto ditto of Georgia.

16. Ditto ditto of ordinary Sea Island.

17. Leaf of St. Helena or Vine-leaved Cotton.

19. Ditto of another variety of Vine-leaved Cotton probably Themban-Wa of the Burmese; of this I have only two plants which have not yet fructified from being one of the *late* class?

From J. V. THOMPSON, ESQ. M. D., *dated Sydney, N. S. Wales, June 28th*, 1841.

TO H. H. SPRY, ESQ. M. D. *Secretary, Agricultural and Horticultural Society.*

I beg to send the Society a packet of seeds of the Mangrole Cotton, and a sample of the wool; it is one of about forty different varieties I have under cultivation in a small way in my own garden, and at Moreton-bay in about 27°. South Latitude. It appears to be one of those admirably adapted for culture in *India*, but not *here*, for reasons I shall state. Mr. Ritchie appears to have brought it into notice before the Select Committee of the House of Commons on Indian Affairs, and Dr. Ure alludes to it in his late work on the Cotton Manufactures of Great Britain, as follows in p. 133—"There is a village near Mangrole in Kattywar, which produces a small quantity of very fine Cotton. It is cultivated by Natives, and grows only on one particular spot of small extent near the sea coast." The circumstance which militates against this fine Cotton being successfully cultivated *here*, will limit its culture to hotter climates only; as it is one of those varieties which may be classed as *late* Cottons, producing few blossoms the *first* season, and those so late as to be rendered abortive by the setting in of the cold season; so that, to produce *one* uncertain crop of Cotton the second season, *two* entire years' labour must be bestowed upon it.

It may prove desirable that the Society may know, what other kinds I have found to follow a similar course *here*: they are—

Seychelles,

Brasil or Kidney-seeded,

Vine-leaved (St. Helena,)

and probably some of the varieties of Bourbon and of Egyptian Mako, which, another season will enable me to determine. This peculiarity I shall have the satisfaction of explaining the cause of, in a future communication, when some illustrative drawings are completed which are now in progress.

Having an intention of trying, how far the earlier kinds can be cultivated with advantage, at Moreton-bay in 27°. South Latitude, I am mustering all my seed, and find that it will only cover from eight to ten acres, at the most: should therefore the Society have any seed at their disposal, I should feel greatly obliged by being favored with as much as can be spared, particularly of *Sea-Island,* and what is called *Bourbon* in India (Gossypium Barbadense, according to Roxburgh.)

Wishing to confine this communication to Cotton, I should like to see the Cotton Report alluded to by Dr. Campbell, in the August Proceedings p. 32, and beg to add two memorandums on Cotton from my adversaria.

Extract from Dr. Ure's Cotton Manufactory, p. 133, *vol.* 1. "Dr. Wallich, brought home several samples of Cotton from the Coast of Martaban to the India House. They were not exceeded by the Cotton of any other country, in the quality of the staple, or the facility of its separation from the seed."

Col. Symes, in his embassy to the Court of Ava, alludes to the Cotton culture, and states that Chagaing, opposite to Ava, is the emporium for Cotton, describes the mode of separating the wool from the seeds by means of the usual Pedal Roller-Gin, and that the richest merchant in the Empire resides there, and deals in this article alone. By this it would appear to be an excellent place to send to find a stock of superior cotton seed, as from the mode of separating the seeds, it must be a long-stapled variety of easy separation that is under cultivation.

Sydney, August 28th, 1841.

I have just time to say that I have the pleasure of forwarding a small packet of Mangrole Cotton and seed just received from Moreton-bay, where this variety finds a climate sufficiently warm to bring its pods to maturity. It appears to be the best sample, I have as yet had from thence, and corresponds with some I sent to Mr. Holt at Liverpool last year, who valued it at from 9*d* to 10*d*. per ℔.

Correspondence relative to the present mode of manufacturing silk in Mysore, with suggestions for its improvement.

[Presented to the Society.]

FROM DR. SMITH TO MR. C. BLECHYNDEN.

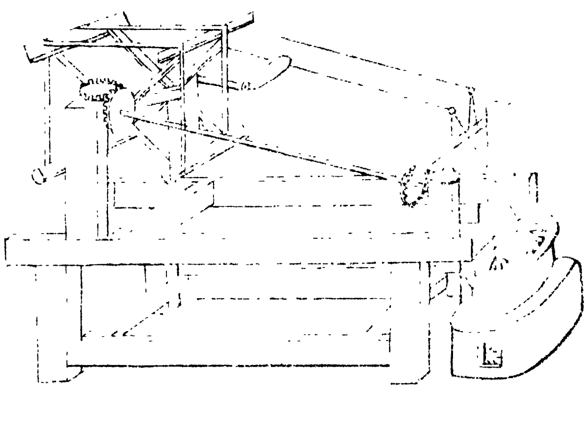
Bangalore, 11th August, 1841.

Having been favored with an extract of your letter dated 1st ultimo, to the address of the Assistant Secretary, Horticultural Society of Calcutta, and having been advised to place myself in communication with you, I gladly hasten to avail myself of this invitation; and beg to tender you, the best acknowledgments of the Bangalore Horticultural Society, for the kind proffer of your assistance, in enabling us to accomplish the desideratum of improving the silk culture of Mysore, by the introduction of other varieties of the insect, superior to that at present possessed by the Society.

In order to give you all the information in my power regarding the silk worm of Mysore, (of which it is not supposed we have any variety) it will be necessary to state that the eggs are hatched all the year round, in from 10 to 15 days, and that the cocoons are formed in 40 days, there being thus 9 crops in the year. The produce is a very coarse silk, of which I enclose a specimen from the Bazaar, and also a small skein reeled by a member of the Society with more care. There appears in both the specimens, a harshness or superabundance of gum, which distinguishes them from the raw silk of European commerce. The reel used for each is shewn in the annexed sketch, the only difference being, that the better sample had the benefit of a better made reel than the other.

It is understood, that a superior description of reel is in use in Bengal, which is entirely managed by one person, who by means of a tredle works the reel, at the same time that he regulates the temperature of the water in the boiler, and performs the other business of a reeler. This is undoubtedly

Silk - Reel used in Mysore



a great improvement, and the Society would be very much obliged to you for a plan of this machine if you are acquainted with it, or can otherwise procure it; as it is their object, not only to introduce a superior worm, but also an economical and approved method of taking advantage of it; for the efforts of the Society would be neutralized, if after establishing better cocoons here, the silk were to be deteriorated, as at present, in the reeling.

Pray tell us the value of the enclosed specimens in the English and Indian market, and if that marked No. 1 'which has been reeled with care' is in a fit state for the English market? How many threads is it desirable to wind off at once, I mean 5, 6, 8, or 10 cocoons? We shall be thankful for specimens of all the varieties of worms, which will bear the long Tappall journey.

MR. C. BLECHYNDEN TO DR. SMITH IN REPLY.

Ghautall, (Radnagore District) 11*th October*, 1841.

Dear Sir,—I had the pleasure of receiving your favour of the 11th August in due course.

A great press of business, combined with other causes, has prevented my sending a reply so soon as I could have wished.

I trust however that the delay will not be of consequence, and that the information now furnished, may prove acceptable to your society.

Perhaps, for the sake of a readier reference, it would be as well that I gave the substance of your queries and my replies, *seriatim*.

" The eggs produced by the silk worm of Mysore, are hatched all the year round, in from 10 to 15 days."	I may mention in the first place, that the time required for hatching the eggs of the worm of Mysore, would appear to be 3 days in excess of the period consumed in Bengal.

The following detailed statement will shew the time required for the completion of the process.

Time required for hatching the egg of the Bengal worm is	7 days.
Period after hatching and casting first skin (during which time the insect eats for 3 days and lies dormant for two)	5 ,,
Time consumed between first and second stages (eating for 2½ and remaining dormant 1½)....	4 ,,
Between third stage till the time the insect commences spinning	6 ,,
Add the time the insect remains a chrysalis....	7 ,,
In all......	29 ,,

"In Mysore, the Cocoons are formed in forty days."

It would thus appear, that the difference of time in the completion of process between the two worms, is eleven days.

The temperature of Mysore I believe is much cooler than that of Bengal, and this may account for the eggs requiring a longer time to come to maturity, and the same cause may affect the after stages of the existence of the insect. This loss of time may be obviated by increasing the temperature of the rearing room.

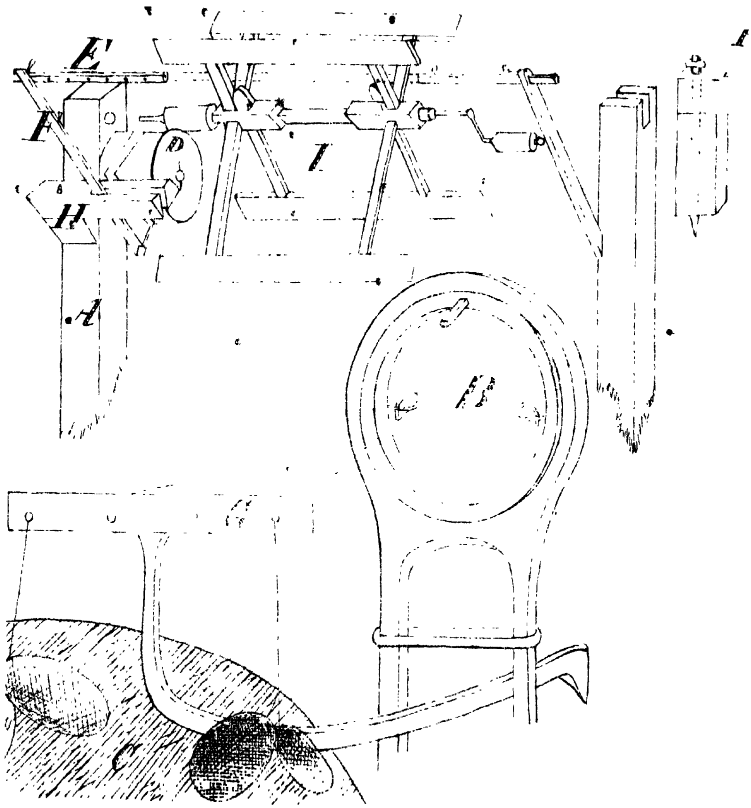
"The produce of the Mysore worm is a very coarse silk, of which I enclose a specimen from the bazar, and also a small skein reeled by a Member of the Society."

These specimens are certainly of inferior quality. From enquiries made, I have ascertained that the following would be about their value per seer of, 80 Sa. Wt.

No. 1,	7	Rs. per sr.
,, 2,	9	,,
,, 3,	8	,,
,, 4,	9½	,,

1 & 2 specimens of bazar silk.

I have no opportunity at



References

A A Reel Posts

B Chandkul, Nädere Name, Junctus.

C Reeler

D Guide Roller.

E Lazy Stick.

F Guide Stick.

G Eyes or Pytee cul.

HH Guide Stick Holder

I Reel.

3 & 4 ditto reeled by Capt. Green.

present, of learning the London prices.

One of the most apparent faults of this silk is its bad color. This arises, I should say, from the circumstance of the cocoons having been boiled in copper pans instead of earthenware, and I should imagine that at the time of reeling the silk, the water in which the cocoons were placed, was not changed often, as should be done by adding water repeatedly. This latter precaution would not only have assisted to give the silk a better color, but would have freed it somewhat more from the gum, the superabundance of which renders these specimens harsh and hard.

The specimen (No. 3,) is better than the bazar samples; the threads, however, are of various sizes. The fault can be remedied by using an instrument (see letter B.) represented in the accompanying drawing, which I have the pleasure to enclose.

Silk of the quality of your musters, is brought for exportation to the North West Provinces, and at Mirzapore, carpets are made from the refuse silk or jute.

" The reel used for each specimen is shewn in the annexed sketch, the only difference being that the better sample had the benefit of a better made reel than the other."

Reels similar to the drawing here alluded to were in general use some years ago, when these Filatures were the property of Government, and they are still in use at some of our factories.

The new system of reeling (as described in the enclosed sketch) has been found to answer better, inasmuch as the thread has much of its moisture wrung out of it by the force with which the layer moves; besides this advantage the machinery is formed on a much more simple principle than that which formerly obtained.

" It is understood that a

I am not aware of the exis-

superior description of reel is in use in Bengal, which is entirely managed by one person, who by means of a tredle, works the reel, at the same time he regulates the temperature of the water in the boiler, and performs the other business of a reeler."

tence of a reel answering this description.

A reel made of iron, and worked on a new principle has lately been introduced into this filature, by means of which twenty reels are turned by a single man; it also combines many other improvements. I regret that circumstances will not allow of my affording a more minute detail of this reel.

"Pray tell us the value of the enclosed specimens? How many threads is it desirable to wind off at once?"

To the first of these questions I have already given an answer; in regard to the latter I may mention that in the rainy season, 8-10 and 10-12 cocoons, ought to be given to a thread, as it is found that in consequence of the quality of the cocoons reared during that period not being so good, finer kinds will not answer; added to this, the least damp causes the silk to loose its color and become woolly.

"We shall be thankful for specimens of all the varieties of worms which will bear the long Tappaul journey."

I have sent by banghy, a small tin box containing cocoons, the produce of my own cocoonery. The worms which formed these cocoons, are called cocoons of the rainy bund (crop) *their eggs will not keep from hatching beyond seven days.* I have made many attempts to prevent their coming to life so soon, in order that I might be able to send you some; but all my efforts have proved unsuccessful, and I am consequently obliged to delay forwarding eggs, till those of the dry or March bund insect (known by the name of the large cocoon) can be transmitted. These latter could be sent at once, but I am loath to do so, lest the heat to which they would be subjected during the journey, should cause a pre-

mature hatching, and consequent loss, for they will not thrive during the cold months.

I hope however to have the pleasure of sending the eggs in the month of December.*

In the packet alluded to above, I have sent for your inspection a muster of silk, reeled in the filatures under my superintendence, as also a muster of that sold in the bazar of this town.

I think I have answered the questions contained in your letter, and given all the information that at present occurs to me. Should there be any other points on which you wish for information I shall be happy to afford it, and give every assistance in my power towards effecting the very desirable object contemplated by your Society.

* The eggs were sent in December last according to promise.

Memoranda concerning some seeds sent from Cabul. *By* LT. VINCENT EYRE., *Deputy Commissary of Ordnance.*

Cabul, 18th Sept., 1841.

I have the pleasure to forward three small packets of seeds, which I trust may be acceptable to your Society.

No. 1, contains the seeds of a large umbelliferous plant, which grows plentifully on the hills in the vicinity of Cabul, and which attracted my particular notice, from a resinous juice which I observed exuding from it very profusely, and which on examination, seemed to coincide with the descriptions I had read of *gum ammoniac*.

I submitted this substance to a medical gentleman, in order that he might put it to the test, and he has given me his opinion that it is decidedly the same in all respects as the *ammoniacum* of commerce. If this be the case, I think Mr. Griffiths can scarcely have failed to become acquainted with the fact, and I merely write this in the very forlorn hope that I may not have been anticipated. According to the most recent information in my possession, the plant which yields *gum ammoniac*, is still a desideratum with botanists. The plant, whose seeds I now send, attains the height of six feet, with a round stem three inches in diameter. In its mode of growth it resembles an *Heracleum*, but I have not yet seen it in flower. The gum on first exuding is white and milky, but as it becomes hard, attains a pale yellow colour, has a faint odour, and a bitter unpleasant taste.*

* Shortly after the dispatch of the above seeds, Mr. Eyre promised to furnish Dr. Mouat, with a specimen of the gum resin for analysis, together with the entire plant producing it, with a view to its identification. This he was unable to accomplish on account of the breaking out of the Cabul insurrection, and his having since remained a captive in the hands of the Affghans. The *Gum resin Ammoniacum*, so long known in commerce and used in medicine, is now known to be produced by the *Dorema Ammoniacum* of Don, which is a herbaceous plant belonging to the natural order *Umbelliferæ*, and was found abundantly by Sir John McNeill in the province of *Irak* in Persia as well as on the low hills near Herat; and more recently

No. 2, contains a few fresh seeds of our famous Rhubarb, which I gathered in July, on the bleak lofty ridges of the Pughman range.

No. 3, is a very beautiful ornamental shrub, well worthy of notice, called by the Affghans *Arghawán*, which grows wild in the hills of Kohistan, and is a great favorite in the Cabul gardens. It seems to be a species of *Cercis*, regarding one of which genus, Dr. Lindley says, that "it renders the gardens of Turkey resplendent with its myriads of purple flowers." The same may be said of the *Arghawán*, with reference to Cabul. Dr. Royle mentions a plant which he calls *Indigofera-arghawán*; but, unless he is altogether mistaken in the genus, he must allude to another plant, for the *Arghawán* of Cabul is assuredly not an *Indigofera*.

In the spring season, I am told, *thousands* of Affghans visit Kohistan, for the sole purpose of admiring the gorgeous spectacle which this plant presents in its natural state when flowering *en masse* on the hilly slopes of that country. I hope the citizens of Calcutta may ere long enjoy a similar gratification.

by Dr. G. Grant, of the Bombay medical service, in Syghan, near Bameean, on the N. W. slope of the Hindoo Coosh. It is stated that in all the Asiatic localities the *Ferula Assafœtida* is found growing beside it.

It is not improbable, that the plant referred to by Lt. Eyre may belong to the same species as the *Dorema*, if it be not identical with it, and we have no means at the present moment of ascertaining whether any of its gummy exudation, finds its way into the European market viâ Bombay, which is the medium through which the Persian *ammoniacum* is exported. The physical characters of the *gum resin* as detailed in the foregoing communication, do not accord exactlywith those which characterize the *Irak* specimens.—ED.

Progress of the Hop Cultivation in the Deyrah Dhoon. By Captain Henry Kirke.

[Presented to the Society.]

Deyrah, December 6th, 1840.

The progress of the Plant with me is very encouraging, and I feel every confidence in extending the plantation to at least an acre during this next year, as I find from experience that it (the Hop plant) grows from slips, as well as by dividing the roots early in spring.

The plants this year grew to the height of 14 feet, and the bends were as thick as a quill. I believe it is customary in England for them to flower the third year, when raised from seed, as mine were. I am therefore looking forward with great anxiety to the month of September next, in hopes of seeing them in blossom.

Do you think the Military Board would be induced to allow a small establishment to be kept up, for the purpose of looking after a Hop plantation?

I have the plant growing in three distinct climates, viz. Deyrah, Lower Mussoory and Upper Mussoory, and find that it thrives better in the temperate climate of Lower Mussoory, than at either of the other places, and feel convinced that if the roots were done justice to, in the shape of manuring, watering, &c. &c., when necessary, that the plants would attain to a much greater degree of perfection than they now have a chance of doing, as my establishments for the cultivation of the Hop are, from necessity, very limited. In reply to Para. 3 of Major De Bude's letter, I should say that sending to England for seed was unnecessary, as I have healthy plants, fully sufficient to increase to any extent within the next two years, and as I received the seed from which they were produced from Lord Auckland, there can be no doubt but it is genuine.

Note on the Cultivation of Foreign Cotton in India. By Mr. W. R. MERCER, *American Planter.*

[Presented to the Society.]

The best season for sowing Cotton seed, I think, would be after the heavy rains of the S. W. monsoons are past. Much water would be likely to injure the fresh planted seed, and also the young plants.

The ground should be prepared by being well broken up with the plough, and cast into ridges eight or ten inches high, and six or seven feet apart—say, six feet for Sea Island. After the ground has been prepared in this manner, if it be allowed to settle for a few days previous to sowing, the young plants are likely to take root more vigorously, than if they sprang up in the freshly ploughed and loose earth.

In planting, one hand with a hoe should make on the top of the ridge, holes about an inch and a half in depth, and 16 or 18 inches apart, another should follow and drop into each hole five or six seeds, and a third coming after, should cover them lightly, taking care to leave the ground perfectly smooth.

When the plants are up, and begin to put forth the third leaf, they should be thinned to two stalks. In doing this, the hoe should be used, to scrape away from the remaining plants any grass or weeds that may have sprung up in the mean time. In a week or ten days, they will be mature enough to require thinning again, when they should be reduced to one stalk, and the hoe used as before to remove any interlopers. At this stage the plough should be used, and a light furrow turned with it towards the Cotton, taking care not to run it so close as to cover any of the plants. The hoe should follow the plough, and draw the mould around the roots, sufficient to replace what had been removed by the previous scrapings, but not any more. When this is done the spaces between the rows should be ploughed afresh to destroy the grass, and

this operation should be repeated as often as they become foul, still using the hoe to keep the spaces between the plants on the ridge clean; the hoe should be so set as to scrape, and not to dig or chop. It is the most essential feature in this cultivation, to keep the ground free from all extraneous vegetation while the plants are growing.

Topping is important, only when the plant is disposed to produce wood and leaves, to the detriment of flowers and pods. When this is the case to take off an inch or two of the top after it has fairly commenced podding—say about the beginning of the fourth month after planting—will materially assist that operation.

The Cotton should be gathered or picked as the pods burst, not leaving it exposed to dews or sun: if it be even dried under cover, it will advantage its glossiness of appearance. The picker should be provided with a bag about the size of a pillow slip, suspended to his side by a strap across his shoulder, in which to thrust the Cotton as he picks it, taking care to keep it free from trashy leaves or dirt of any kind: he should grasp the Cotton with his thumb and three fore fingers, and avoid as much as possible drawing away any of the pod or outer leafy covering.

Sea Island Cotton is always cleaned in America by the roller gin; the saw gin is never used.

Queries relating to Manure: to be circulated among the Indian and Chinese Farmers. *By* LYON PLAYFAIR, PH. D.

[Presented to the Society by G. Playfair, Esq. Inspector General of Hospitals.]

1. Is much value attached to the urine of animals as a manure, and in what state is it applied? What animal is considered to afford the best urine for manure, and to what kind of crops is it applied?

3. Is much night soil (human fœces) used for the purposes of manure? How it is prepared for this purpose, and to what extent is it applied per acre? What kinds of plants are found to be most benefitted by it?

4. State particularly, how the dung reservoirs are made, (if protected from evaporation, &c. &c.) and what substances are usually thrown into them.

5. State whether animal manures are applied fresh, or in a state of putrefaction.

6. State what mineral manures are used, such as lime, gypsum, saltpetre &c. &c. specifying the quantities per acre, the crops to which they are applied, and the manner of their application.

7. Is the land ever left fallow, and if so, how often in twenty years?

8. Is there any rule for the rotation of crops; that is, is there any succession of crops which are found to grow best one after the other?

9. Are the ashes of burnt plants or wood, used for manures? If so, what ashes are preferred, and to what crops are they furnished?

10. Is flesh or blood held in esteem as manure?

11. Are the ground bones of animals used as manure, or are they thought much of?

12. Is saltpetre ever used as manure; if so, to what kinds of land is it applied? Is it used before sowing, along with seed, or after the blade is up?

13. Is much value attached to the dung of domestic animals, such as the cow, horse, sheep, elephant, goats &c. and which animal furnishes the best manure? Are the excrements of snakes used or valued?

14. Is common salt used much as a manure? If so, to what crops, and to what kind of lands?

15. What kinds of manure are found to answer best for bamboos; what for rice; what for Indian corn &c.?

16. Is burned clay ever used as a manure?

17. To London and other places in England, perfect little Oak trees of 1½ foot high, have been sent from China. How do the Chinese manage to make these trees dwarfs?

18. Can corn be grown for three years in succession on any land, or for how many years can crops of corn plants be obtained in succession?

19. State all the different substances usually employed as manure, and all those you have heard have been employed.

20. Is it true that few or no weeds are to be seen in the corn fields of China, and do the Chinese ever use animal manures (not human) for their corn fields?

21. Is it customary to apply the manure on the lands, or are the plants themselves rather manured?

22. Is it the case that the seeds of plants are often steeped in urine before being planted?

23. Is it at all customary to burn the straw of plants, and strew the ashes on the field, or to return it unburnt to the soil?

24. State any details about manures and soils, which you may think interesting, although questions are not here asked about them.

QUERIES INTENDED TO BE SENT TO CHINA.

1. Ascertain how night soil is prepared by the Chinese as a manure, mixed up in the cakes, as it is sold. To be put in a bottle, well corked, and properly labelled.

2. Any soils eminent for great fertility, well corked up, would (a few of them) be valuable.

3 Any artificial manures, sold as such, would be exceedingly valuable.

This to be circulated for the purpose of being translated into Chinese, as that people are the best Agriculturists in the world. It would be very interesting to have the original answer sent in, transmitted to this country, along with the translation; I mean only as a curiosity. Any agricultural curiosities would be highly acceptable. If these questions were properly answered in various districts, they would be a valuable addition to our knowledge.*

* The particular attention of Planters, Mofussil Members, and all who are so situated as to be able to afford information on the important subject of manures, is directed to the above queries. They have been drawn up, by Dr. Lyon Playfair, the translator of Liebig's '*Organic Chemistry in its Applications to Agriculture &c.*,' and likewise an Honorary Member of the Royal Agricultural Society of England, which distinguished honour was recently conferred upon him, for his eminent scientific acquirements, and the great amount of good likely to result from his application of them, to the investigation of the more obscure and little known parts of Agricultural Chemistry. It has been justly remarked by the most recent and distinguished authority on the subject, that "Agriculture has hitherto never sought aid from chemical principles, based on the knowledge of those substances which plants extract from the soil on which they grow, and of those restored to the soil by means of manure. The discovery of such principles will be the task of a future generation, for what can be expected from the present, which recoils with seeming disgust and aversion from all the means of assistance offered it by chemistry, and which does not understand the art of making a rational application of chemical discoveries?" Let us indulge the hope, that the Agricultural Society of India, will ere long cease to labour under this severe, but just censure. Let each member come forward with his item, however apparently unimportant it may appear to be, of sound practical information, founded on facts and the results of his own experience: let the intelligence communicated be confined as much as possible to such facts, and deal as little as possible in unprofitable speculations: and in the course of a very short time, a body of important observations will be collected, which will tend alike to the advance of Agriculture in India, the honour and prosperity of the Society, and the credit of the individuals communicating them. Such were the great objects for which the Society was founded, and such are the ends that may easily be attained, by a little well directed zeal, energy, and observation —ED.

Correspondence relative to the Manufacture of Nipal Paper at Darjeeling, with details as to its cost, relative value, mode of bleaching, and rendering water proof.

From DR. CAMPBELL, *Supt. of Darjeeling, to* T. H. MADDOCK, ESQ., *Secretary to the Govt. of India.*

On the 8th of January, you informed me that Lord Auckland had asked Mr. Hodgson, to try and send to me some persons skilled in the manufacture of Nipal Paper, and His Lordship was pleased to believe, that it would be in my power to employ such persons very usefully at Darjeeling, in the event of their arrival. About the middle of April, I received a letter from the Nipalese Officer, in charge at Hamghurry, accompanied by five paper makers from his station, whom he had been instructed to send to me by his Durbar, at Mr. Hodgson's request.

The party consisted of,

1	Maker or head man	@ Rs. 10 0 0	per mensem.
1	Mate....	@ Rs. 8 0 0	,,
3	Ordinary workers 8 Rs. ea.	24 0 0	
	Total Rs.......	42 0 0	

The head man and his first assistant, were Newars of the valley of Nipal, and the remaining three were low caste Purbutteahs, of the neighbourhood of Ham. They were altogether unfurnished with implements of their craft; and I was equally unprepared with a house for them to work in, and with materials to work upon. As my object was to gain full information for Lord Auckland, on all points connected with the manufacture of paper at this place, where it had never been tried before, rather than to ascertain the lowest cost of its production; I furnished the paper makers with guides to conduct them to the different localities of the paper plant in the neighbourhood, desiring them to carefully examine, and compare the whole, and report to me their choice from which

we should take bark to work upon. They decided upon the paper tree jungle in the neighbourhood of Pucheem, which is at the same elevation as Darjeeling, viz. 7,200 feet, and wished that the manufacture should be there also, on the score of economizing carriage. But, as I preferred having it nearer to my own observation, the vicinity of a stream which crosses the Auckland Road, at Mr. Smoult's location, was selected for the manufactory, and here I built a small house for the purpose, dug a tank, and Lepcha fashion conducted the water into it by bamboo zig zags, from the stream. These particulars are mentioned, as different degrees of virtue are attached by the paper makers to different localities, mainly with reference to the vicinity of a large supply of the plant, and of the woods for furnishing the best ashes, a clear stream of water being always an essential matter.

The next step was to procure the implements. They are few and very simple, as detailed by Mr. Hodgson, in his account of this manufacture (see Journal of the Asiatic Society, for January 1832, and Transactions Agricultural Society, vol. 5, page 228). My party did not make any deviations from Mr. H.'s list of necessaries, except in the use of a flat-stone, and double-headed hand mallets for beating the bark into pulp, instead of a stone mortar and wooden pestle; and in requiring that the boiler should not be of iron, as this metal gave a dark tinge to the paper. I furnished them with a tinned copper vessel which they considered the best; but a brass one will also do, I believe, quite as well. It is indispensible that the stream of water shall constantly flow through the tank, during the making of paper; so as to carry off the Alkali, as it is taken up from the pulp in the frames. It is also necessary that the outer green bark should be entirely removed from the inner bark, the slips of which should be carefully and thoroughly dried as soon as possible, after removal from the tree, and

that they should not again get wet previous to being used: once dried it seems to be of no consequence that it should be made into paper immediately, although the practice is to use it fresh. Much stress is justly laid on the necessity for thoroughly drying the slips of bark, and on this account the beginning of the dry weather (October) is considered the best season for commencing operations. Whether artificial drying, would answer as well as sun drying, I do not know.

The paper makers say not; some bales of bark in being brought from Pucheem to Darjeeling, after having been dried got wet; they mildewed, and were altogether useless, when it was attempted to make paper of them.

The relative value of the ashes, is determined by the absence of colouring matter in the solution, or rather by the whiteness of the paper produced: bad ashes give dingy paper. The favored woods for ashes are,

1st.—The four species of *Bak*, abundant round Darjeeling.

2nd.—The "Bans," a large tree not near Darjeeling.

3rd.—The "Oontees," an alder like tree, common about Darjeeling.

4th.—The "Khusroo," not found near Darjeeling. This is an Ilex, which is nearly allied to the Oaks. It is very common on the Sheopoor mountains, bounding the valley of Nipal to the north. The leaf is very like that of one of the oaks of Darjeeling, with the addition of spikes. The "Khusroo" wood is hard, and nearly as good as Oak for many purposes. A paper manufactory should be built convenient for Oak trees, and the Oak wood or one of the others named, should alone be burned for drying the paper: thus the best ashes are most cheaply procured.

It is reckoned one of the secrets of the craft, that some sticks of the paper tree occasionally put on the fire tend to improve the ashes.

The frames should be made of light wood so as to float easily in the tank. The wood of the Rhododendron, (Gorans)

is that preferred; on this account mine were made of the white wood we call the "Olive" and answered excellently. I have ascertained that there are three species or varieties of the paper tree in use throughout the mountains, and that two of them are very abundant in the Darjeeling tract.

They are characterized as follows:—

1st.—The yellow flowered one. It flourishes at elevations 2000 feet lower than Darjeeling, grows to the size of a tree, and is the least valuable of all; its paper is course and dark colored. 2nd. The whitish-pink flowered one, very abundant, in a belt embracing 2000 feet of elevation, that of Darjeeling 7,200 being the centre; also grows into a tree. This is the most abundant of all throughout the mountains generally, as well as in the Darjeeling tract, and from it is made, by far the largest part of the paper manufactured in Nipal and Sikim. 3d. The scarlet-flowered one. This is not, I believe, a native of Darjeeling tract; should it be so, it will be confined to the top of the Sinchal, above Senœdale, as its usual elevation is said to be 9,000 feet and above. It grows into a tree of larger size than the others, is slower of growth, and its bark is greatly the most valuable as yielding the smoothest and least dingy paper.

I have procured young trees, of the three sorts noticed above, which are now planted in my garden, and shall be able, when they flower to ascertain how far the descriptions are correct. The whitish—pink flowered one, I am familiar with, but have not until now seen the other two.

Should my specimens not flower, I shall at the season have others collected, and sent to Lord Auckland for his satisfaction. The above is what I have added to my information, regarding the materials and implements of paper making, from the paper tree. I am, however, told that the monks (Lamas) at Pemiong in Sikim, have lately made paper whiter than common, and quite as good, from the inner bark of a tree not re-

sembling the paper plant. It is abundant at Darjeeling, and called "Shing nokmo" by the Lepchas: as I have a friend among the Pemiong brotherhood, I shall invite him over in the cold weather, to learn the truth of the statement, and his process of manufacture.

Lord Auckland will probably expect to hear of some improvements having been attempted by me in the manufacture of the Paper, as regards its color and smoothness; the only particulars in which it is not superior to the English article. I am sorry to have nothing encouraging to say, on this head.

Could I have procured them here, I would have tried the use of a succession of fine wire sieves in freeing the pulp of the stringy particles, which give the roughness to the sheets; and for whitening the pulp I would have tried Chlorine, which is so successfully used at home in bleach fields. Failing the possession of these articles, I have subjected the pulp to the action of the sun, air, and rain, as is practised in bleaching wax, and I have some hopes of its succeeding, but cannot yet speak to the fact, as it is under trial only. The stringy portions of the pulp, could certainly be separated by the plan proposed, and a great saving of labour in pounding the pulp, could be effected by simple machinery set in motion by water; but the bleaching, which with us is the great desideratum, must, I conceive, be the work of time and experiment in various ways. I believe that the plan of using the solution of impure wood ashes, is conducive to the dingy color of the paper. The bark when carefully dried is much whiter than the paper, and is turned yellow by boiling in the alkaline solution. The remedy here might be, to use pure ashes only, to filter the solution through sand or charcoal, or even to crystalize the Potash from the fluid previous to using it. The mechanical process of folding and cutting the sheets with smooth edges, might readily be ap-

plied, and would set off the article for the market, as would having frames of the various sizes of English Paper.

The season at which the Paper makers reached me was unfavorable, as the showery weather had commenced. Much time was necessary in the press of other matters to provide a house, implements, and bark for the men; and just as I had a little more time to spare for the matter, the rains have put a stop to proceedings which cannot be renewed till October. As the implements and house are complete, I should like to have the head man kept on, or re-engaged after the rains, and perhaps the contents of this note may in the mean time suggest some experiments to his Lordship for trial. I shall forward by Bhangy to your address specimens of the Paper made here. The quantity on hand is of,

No. 1,	1880	sheets 2 feet	by	$1\frac{1}{2}$
No. 2,	1420	Do	Do	Do
Total	3300			

weighing 1 maund 7 Seers.

I cannot separate the cost of the house and implements from that of the whole Paper, but I can give the actual cost in labor of one day's manufacture, which will give an idea of what the article may be produced at. The outlay on house &c. would add nil to the cost of the paper in the course of a year's work.

Wages of 5 men for sheets of Paper one day, Rs. 1. 6. 5. made on an average 120—96 sheets per Rupee, or per maund Rs. 25-8.

This result cannot be considered as more than an approximation to the cost by contract. Doubtless it could be made much cheaper under that system, or under more close supervision than I had it in my power to afford. The Paper is however excellent of its kind, although somewhat higher priced than I had anticipated. I beg to state again that my

chief objects were to require information on this subject for his Lordship, to ascertain if the article could be made of good quality here, and in large quantities; and if possible to give the art to the Lepchas who were ignorant of it. These objects have all been gained to a considerable extent, and I would therefore beg that the cost part of the matter may not have any importance attached to it by his Lordship, in deciding on the propriety or otherwise of countenancing a permanent factory, at this place, for the supply of stationary to the neighbouring stations of the plains.

For facility of comparing the results of this confessedly costly experiment, with the paper of the plains, I will repeat the details. Cost of 120 sheets, 2 feet by ½ Rs. 1 6 5. 120 sheets weigh 1 seer 12 Chittacks. Cost per maund, 25 8 0.

I have much pleasure in reporting that I succeeded in persuading two Lepchas, subjects of Government at Darjeeling, to learn the art; and that with their assistance it would be easy at any time to renew the manufacture at His Lordship's desire.

The quantity manufactured has been 1 maund, 7 seers, and is now in store to be disposed of as His Lordship may direct.

From T. H. MADDOCK, ESQ., *Secy. to Govt. of India, to* DR. CAMPBELL.

I have been directed by the Governor General in Council to acknowledge your (demi official) letter to Mr. Colvin of the 4th Inst. and to express to you His Lordship's satisfaction, with the results of your interesting experiment in paper making.

2d.—The Governor General in Council desires, that you will continue your present course of experimental paper making till further notice, keeping in pay the manufacturers necessary for that purpose.

3rd.—Appended to this despatch is a statement of the prices of country paper in the Calcutta market, which will be useful, as furnishing a standard, to which you should endeavour to bring down the cost of your manufacture.

4th.—Some of the paper which you have prepared, will be placed in the hands of Dr. O'Shaughnessy, who has seen your specimen, and will make experiments for bleaching it. To this end he has already made some trials, and the accompanying bleached pieces, are evidence of what he is likely to accomplish. The result of his experiments, with all necessary information, will be duly communicated to you.

5th.—You are now requested to send by dâk, at several despatches, twenty or thirty sheets of the paper to be made over to Dr. O'Shaughnessy for experiment.

Statement of prices paid in Calcutta, for the undermentioned Country Papers.

Scrampore Royal paper......	@	7	14	per Ream.
Ditto medium ditto.. ..		6	6	,,
Superfine Bengal ditto.. ..		9	8	,,
Bengal paper 1st sort		6	4	,,
Ditto 2d ditto......		5	4	,,
Ditto 3d ditto.. ..		3	8	,,
Ditto 4th ditto......		2	8	,,
Ditto thin........		4		,,
Balasore paper		20		,,
Blue Bengal ditto		6		,,
Arwully ditto		13		,,
Country cartridge ditto ...		13		,,
Heranundy or Sunnud ditto. .		25		

In continuation of the letter of this Department, dated the 9th July, I am directed by the Right Hon'ble the Governor General in Council, to draw your attention to the

circumstance, that filtering paper from England, of which there has been during the last three years an average consumption in Calcutta of 6 reams per annum, costs 9 Rupees per ream, whereas it is understood that at Darjeeling it can be manufactured for about 3 rupees per ream. His Lordship in Council, would be glad to hear from you, as to your means of furnishing filtering paper at the lesser cost, with any other suggestions on this point, which it may occur to you as useful to be made known.

2. I am further desired to inform you that a small piece of Darjeeling paper, prepared with Indian rubber, has been found capable of being rendered perfectly water proof. The expences of the preparation is found to be a trifle, and the process so simple, that it may hereafter be done, it is hoped, by the Hill people themselves. The increase to the weight of the paper is one-third. The prepared Darjeeling paper, however, weighs but one-third of the same size, of the wax cloth used at the Government Post Office.

3. It is supposed by the Post Office authorities at Calcutta, that a great saving of expenses, as well as increased protection to the packets, may be secured by substituting for the wax cloth, costing 8 annas per yard, the prepared Darjeeling paper referred to.

4. In this view, and in the hope that it may arrive in time for experiment, on the occasion of the ensuing Bombay Mail of the 7th, and following express, I am desired to request you will immediately transmit by Dak some of the largest sheets of Darjeeling paper, to be prepared and tried accordingly.

From DR. CAMPBELL, *to* T. H. MADDOCK, ESQ.

I have the honor to acknowledge the receipt of your letter of the 19th instant, communicating the satisfaction of the Governor General, at the results of my experiment in paper making.

2. In continuation of my letter to Mr. Colvin, of the 4th Instant, I have to inform you that the trials made by me for bleaching the pulp have not been successful. I tried one portion by keeping it immersed in water, and exposed to the rain and air. The pulp, in this instance, became considerably whiter, but it lost all that wonderful toughness for which, in its natural state, the paper is so remarkable. Another portion I had spread out on a board, exposed to the elements. It retained its distinguishing property unimpaired, but it was very little whiter than pulp which had not been so exposed.

3. From the result of these trials, I shall not again try the immersion plan, but I am disposed to give further trial to the other, after the cessation of the rains, when sunshine will predominate and not rain and clouds as at this season.

4. I beg to be favored with the dimensions of each kind of country paper, noted and priced in your letter under acknowledgment, and also with the weight per ream of each, to enable me to institute a fair comparison, on the relative cost of these papers and my own.

5. I feel thankful for the authority to go on with the experiment, and shall renew it after the rains, if possible.

From DR. W. B. O'SHAUGHNESSY, *Chemical Examiner, to* T. H. MADDOCK, ESQ.

In returning to your office the accompanying documents, I have the honor to acquaint you that, I have succeeded in bleaching the Darjeeling Paper by a very cheap and easily applicable process. Specimens of the bleached paper, have been submitted to the Right Hon'ble, the Governor General, for his inspection.

2. In order to have the plan tested practicably, and on an adequate scale, I have communicated the process to Mr. Marshman, proprietor of the Serampore Paper Mills, who will make known to your Department, the result of the trials he has willingly undertaken to carry on.

3. The process consists essentially, in using a solution of *Chlorine* in *water*; instead of *Chloride* of *Lime* generally employed. The lime of the latter, with the colouring matter of the Darjeeling paper, forms a substance very difficultly bleached, but which yields at once to the simple watery solution.

4. The materials employed are red lead (350 grains), common salt (60), sulphuric acid (¼ fluid ounce) water (8) fluid ounces. These proportions are observed on any scale, and instead of strong sulphuric acid, a proportionally larger quantity of the weak acid now abundantly manufactured in Calcutta, may be employed.

Usual price 8 Rs. 4 As. per maund of 80 Sa. Wt.	*Red Lead* is a common and cheap bazar article.

5. One great advantage in having recourse to this process is, that it avoids the necessity of using the Oxide of Manganese, which is not found in the bazar.

6. For further details and results I beg leave to refer you to Mr. Marshman.

From DR. CAMPBELL, *to* T. H. MADDOCK, ESQ.

I have the honor to acknowledge the receipt of your letter of the 29th Ultimo, forwarding to me copies of correspondence with Professor O'Shaughnessy, and Mr. Marshman, respecting the bleaching of the paper made by me at Darjeeling. It gives me great pleasure to find that the use of *chlorine*, suggested by me, in my letter of the 4th July to Mr. J. R. Colvin, as the most probably efficacious material for bleaching the paper, has been found to answer so well in the hands of the Professor.

2. I am glad to inform you that I can now furnish a quantity of the dried paper tree-bark for Mr. Marshman, and I suggest, being directed to do so, the cost *here* of dried bark will be say 2 or 2-8 Rs. per md., and with the aid of bul-

lock carriage, now becoming available at Darjeeling, it may be shipped at Dulalgunge for say 3 to 3-8 per md. Perhaps Mr. Marshman may be able to say how far it will be desirable, to have the raw material at this rate. There is very little loss of material in preparing the bark for use.

A few unimportant notes connected with the above correspondence, have been omitted by the Editors. They merely related to the transmission of the documents from one office to another, and the forwarding of a supply of the Paper for experiment, to Mr. Marshman of Serampore.

NOTES AND SELECTIONS.

The Art of Culture.

The methods employed in the cultivation of land are different in every country, and in every district; and when we inquire the causes of these differences we receive the answer, that they depend upon circumstances. (*Les circonstances font les assolemens.*) No answer could show ignorance more plainly, since no one has ever yet devoted himself to ascertain what these circumstances are. Thus also when we inquire in what manner manure acts, we are answered by the most intelligent men, that its action is covered by the veil of Isis; and when we demand further what this means, we discover merely that the excrements of men and animals are supposed to contain an incomprehensible *something* which assists in the nutrition of plants, and increases their size. This opinion is embraced without even an attempt being made to discover the component parts of manure, or to become acquainted with its nature.

In addition to the general conditions, such as heat, light, moisture, and the component parts of the atmosphere, which are necessary for the growth of all plants, certain substances are found to exercise a peculiar influence on the development of particular families. These substances either are already contained in the soil, or are supplied to it in the form of the matters known under the general name of manure. But what does the soil contain, and what are the components of the substances used as manure? Until these points are satisfactorily determined, a rational system of agriculture cannot exist. The power and knowledge of the physiologist, of the agriculturist and chemist must be united for the complete solution of these questions; and in order to attain this end, a commencement must be made.

The *general* object of agriculture is to produce in the most advantageous manner certain qualities, or a maximum size, in certain parts or organs of particular plants. Now, this object can be attained only by the application of those substances which we know to be indispensable to the development of these parts or organs, or by supplying the conditions necessary to the production of the qualities desired.

The rules of a rational system of agriculture should enable us, therefore, to give to each plant that which it requires for the attainment of the object in view.

The *special* object of agriculture is to obtain an abnormal development and production of certain parts of plants, or of certain vegetable matters, which are employed as food for man and animals, or for the purposes of industry.

The means employed for effecting these two purposes are very different. Thus the mode of culture, employed for the purpose of procuring fine pliable straw for Florentine hats, is the very opposite to that which must be adopted in order to produce a maximum of corn from the same plant. Peculiar methods must be used for the production of nitrogen in the seeds, others for giving strength and solidity to the straw, and others again must be followed when we wish to give such strength and solidity to the straw as will enable it to bear the weight of the ears.

We must proceed in the culture of plants in precisely the same manner as we do in the fattening of animals. The flesh of the stag and roe, or of wild animals in general, is quite devoid of fat, like the muscular flesh of the Arab; or it contains only small quantities of it. The production of flesh and fat may be artificially increased; all domestic animals, for example, contain much fat. We give food to animals, which increases the activity of certain organs, and is itself capable of being transformed into fat. We add to the quantity of food, or we lessen the processes of respiration and perspiration by preventing motion. The conditions necessary to effect this purpose in birds are different from those in quadrupeds; and it is well known that charcoal powder produces such an excessive growth of the liver of a goose, as at length causes the death of the animal.

The increase or diminution of the vital activity of vegetables depends only on heat and solar light, which we have not arbitrarily at our disposal; all that we can do is to supply those substances which are adapted for assimilation by the power already present in the organs of the plant. But what then are these substances? They may easily be detected by the examination of a soil, which is always fertile in given cosmical and atmospheric conditions; for it is evident, that the knowledge of its state and composition must enable us to

discover the circumstances under which a sterile soil may be rendered fertile. It is the duty of the chemist to explain the composition of a fertile soil, but the discovery of its proper state or condition belongs to the agriculturist; our present business lies only with the former.

Arable land is originally formed by the crumbling of rocks, and its properties depend on the nature of their principal component parts. Sand, clay, and lime, are the names given to the principal constituents of the different kinds of soil.

Pure sand and pure limestone, in which there are no other inorganic substances except siliceous earth, carbonate or silicate of lime, form absolutely barren soils. But argillaceous earths form always a part of fertile soils. Now from whence come the argillaceous earths in arable land; what are their constituents, and what part do they play in favouring vegetation? They are produced by the disintegration of aluminous minerals by the action of the weather; the common potash and soda felspars, Labrador spar, mica, and the zeolites, are the most common aluminous earths, which undergo this change. These minerals are found mixed with other substances in granite, gneiss, mica-slate, porphyry, clay-slate, grauwacke, and the volcanic rocks, basalt, clinkstone, and lava. In the grauwacke, we have pure quartz, clay-slate, and lime; in the sandstones, quartz and loam. The transition limestone and the dolomites contain an intermixture of clay, felspar, porphyry, and clay-slate; and the mountain limestone is remarkable for the quantity of argillaceous earths which it contains. Jura limestone contains 3—20, that of the Wurtemberg Alps 45—50 per cent. of these earths. And in the *muschelkalk* and the *calcaire grossier* they exist in greater or less quantity.

It is known, that the aluminous minerals are the most widely diffused on the surface of the earth, and as we have already mentioned, all fertile soils, or soils capable of culture, contain alumina as an invariable constituent. There must, therefore, be something in aluminous earth which enables it to exerise an influence on the life of plants, and to assist in their development. The property on which this depends is that of its invariably containing potash and soda.

Alumina exercises only an indirect influence on vegetation, by its power of attracting and retaining water and ammonia; it is itself very rarely found in the ashes of plants, but silica is always present,

having in most places entered the plants by means of alkalies. In order to form a distinct conception of the quantities of alkalies in aluminous minerals it must be remembered that felspar contains 17¾ per cent. of potash, albite 11·43 per cent. of soda, and mica 3—5 per cent.; and that zeolite contains 13—16 per cent. of both alkalies taken together. The late analyses of *Ch. Gmelin, Löwe, Fricke, Meyer*, and *Redtenbacher*, have also shown, that basalt contains from ⅓ to 3 per cent. of potash, and from 5—7 per cent. of soda, that clay-slate contains from 2·75—3·31 per cent. of potash, and loam from 1½—4 per cent. of potash.

If, now, we calculate from these data, and from the specific weights of the different substances, how much potash must be contained in a layer of soil, which has been formed by the disintegration of 40,000 square feet (I Hessian acre) of one of these rocks to the depth of 20 inches, we find that a soil of

Felspar	contains	.. ..		1,152,000	lbs.
Clink-stone	,,	from	200,000 to	400,000	,,
Basalt	,,	,,	47,500 ,,	75,000	,,
Clay-slate	,,	,,	100,000 ,,	200,000	,,
Loam	,,	,,	87,000 ,,	300,000	,,

Potash is present in all clays; according to *Fuchs*, it is contained even in marl; it has been found in all the argillaceous earths in which it has been sought. The fact that they contain potash may be proved in the clays of the transition and stratified mountains, as well as in the recent formations surrounding Berlin, by simply digesting them with sulphuric acid, by which process alum is formed. *(Mitscherlich.)* It is well known also to all manufacturers of alum, that the leys contain a certain quantity of this salt ready formed, the potash of which has its origin from the ashes of the stone and brown coal, which contain much argillaceous earth.

When we consider this extraordinary distribution of potash over the surface of the earth, is it reasonable to have recourse to the idea, that the presence of this alkali in plants is due to the generation of a metallic oxide by a peculiar organic process from the component parts of the atmosphere. This opinion found adherents even after the method of detecting potash in soils was known, and suppositions of the same kind may be found even in the writings of some physiolo-

gists of the present day. Such opinions belong properly to the time when flint was conceived to be a product of chalk, and when everything, which appeared incomprehensible on account of not having been investigated, was explained by assumptions far more incomprehensible.

A thousandth part of loam mixed with the quartz in new red sandstone, or with the lime in the different limestone formations, affords as much potash to a soil only 20 inches in depth as is sufficient to supply a forest of pines growing upon it for a century. A single cubic foot of felspar is sufficient to supply a wood, covering a surface of 40,000 square feet, with the potash required for five years.

Land of the greatest fertility contains argillaceous earths and other disintegrated minerals with chalk and sand, in such a proportion as to give free access to air and moisture. The land in the vicinity of Vesuvius may be considered as the type of a fertile soil, and its fertility is greater or less in different parts, according to the proportion of clay or sand which it contains.

The soil which is formed by the disintegration of lava cannot possibly, on account of its origin, contain the smallest trace of vegetable matter, and yet it is well known, that when the volcanic ashes have been exposed for some time to the influence of air and moisture, a soil is gradually formed in which all kinds of plants grow with the greatest luxuriance. This fertility is owing to the alkalies which are contained in the lava, and which, by exposure to the weather, are rendered capable of being absorbed by plants. Thousands of years have been necessary to convert stones and rocks into the soil of arable land, and thousands of years more will be requisite for their perfect reduction, that is for the complete exhaustion of their alkalies.

We see from the composition of the water in rivers, streamlets, and springs, how little rain-water is able to extract alkali from a soil, even after a term of years; this water is generally soft, and the common salt, which even the softest invariably contains, proves that those alkaline salts, which are carried to the sea by rivers and streams, are returned again to the land by wind and rain.

Nature itself shows us what plants require at the commencement of the development of their germs and first radicle fibres. *Bequerel*

has shown that the *gramineæ, leguminosæ, cruciferæ, cichoraceæ, umbelliferæ, coniferæ, and cucurbitaceæ* emit acetic acid during germination. A plant which has just broken through the soil, and a leaf just burst open from the bud, furnish ashes by incineration, which contain as much, and generally more, of alkaline salts than at any period of their life. (*De Saussure*). Now we know also from the experiments of *Bequerel* in what manner these alkaline salts enter young plants; the acetic acid formed during germination is diffused through the wet or moist soil, becomes saturated with lime, magnesia, and alkalies, and is again absorbed by the radicle fibres in the form of neutral salts. After the cessation of life, when plants are subjected to decomposition by means of decay and putrefaction, the soil receives again that which had been extracted from it.

Let us suppose that a soil has been formed by the action of the weather on the component parts of granite, grauwacke, mountain limestone, or porphyry, and that nothing has vegetated for thousands of years. Now this soil would have become a magazine of alkalies, in a condition favourable for their assimilation by the roots of plants.

The interesting experiments of *Struve* have proved that water impregnated with carbonic acid decomposes rocks which contain alkalies, and then dissolves a part of the alkaline carbonates. It is evident that plants, also, by producing carbonic acid during their decay, and by means of the acids which exude from their roots in the living state, contribute no less powerfully to destroy the coherence of rocks. Next to the action of air, water, and change of temperature, plants themselves are the most powerful agents in effecting the disintegration of rocks.

Air water, and the change of temperature prepare the different species of rocks for yielding to plants the alkalies which they contain. A soil which has been exposed for centuries to all the influences which effect the disintegration of rocks, but from which the alkalies have not been removed, will be able to afford the means of nourishment to those vegetables which require alkalies for its growth during many years; but it must gradually become exhausted, unless those alkalies which have been removed are again replaced; a period, therefore, will arrive, when it will be necessary to expose it, from time to time, to a further disintegration, in order to obtain a new supply of

soluble alkalies. For small as is the quantity of alkali which plants require, it is nevertheless quite indispensable for their perfect development. But when one or more years have elapsed without any alkalies having been extracted from the soil, a new harvest may be expected.

The first colonists of Virginia found a country, the soil of which was similar to that mentioned above; harvests of wheat and tobacco were obtained for a century from one and the same field without the aid of manure, but now whole districts are converted into unfruitful pasture land, which without manure produces neither wheat nor tobacco. From every acre of this land, there were removed in the space of one hundred years 1200 lbs. of alkalies in leaves, grain, and straw; it became unfruitful therefore, because it was deprived of every particle of alkali, which had been reduced to a soluble state, and because that which was rendered soluble again in the space of one year, was not sufficient to satisfy the demands of the plants. Almost all the cultivated land in Europe is in this condition; fallow is the term applied to land left at rest for further disintegration. It is the greatest possible mistake to suppose that the temporary diminution of fertility in a soil is owing to the loss of humus; it is the mere consequence of the exhaustion of the alkalies.

Let us consider the condition of the country around Naples, which is famed for its fruitful corn-land; the farms and villages are situated from 18 to 24 miles distant from one another, and between them there are no roads, and consequently no transportation of manure. Now corn has been cultivated on this land for thousands of years, without any part of that which is annually removed from the soil being artificially restored to it. How can any influence be ascribed to humus under such circumstances, when it is not even known whether humus was ever contained in the soil?

The method of culture in that district completely explains the permanent fertility. It appears very bad in the eyes of our agriculturists, but there it is the best plan which could be adopted. A field is cultivated once every three years, and is in the intervals allowed to serve as a sparing pasture for cattle. The soil experiences no change in the two years during which it there lies fallow, further than that it is exposed to the influence of the weather, by which a fresh por-

tion of the alkalies contained in it are again set free or rendered soluble. The animals fed on these fields yield nothing to these soils which they did not formerly possess. The weeds upon which they live spring from the soil, and that which they return to it as excrement, must always be less than that which they extract. The field, therefore, can have gained nothing from the mere feeding of cattle upon them; on the contrary, the soil must have lost some of its constituents.

Experience has shown in agriculture, that wheat should not be cultivated after wheat on the same soil, for it belongs with tobacco to the plants which exhaust a soil. But if the humus of a soil gives it the power of producing corn, how happens it that wheat does not thrive in many parts of Brazil, where the soils are particularly rich in this substance, or in our own climate, in soils formed of mouldered wood; that its stalk under these circumstances attains no strength, and droops prematurely? The cause is this,—that the strength of the stalk is due to silicate of potash, and that the corn requires phosphate of magnesia, neither of which substances a soil of humus can afford, since it does not contain them; the plant may indeed, under such circumstances, become an herb, but will not bear fruit.

Again, how does it happen that wheat does not flourish on a sandy soil, and that a calcareous soil is also unsuitable for its growth, unless it be not mixed with a considerable quantity of clay? It is because these soils do not contain alkalies in sufficient quantity, the growth of wheat being arrested by this circumstance, even should all other substances be presented in abundance.

It is not mere accident that only trees of the fir tribe grow on the sandstone and limestone of the Carpathian mountains and the Jura, whilst we find on soils of gneiss, mica-slate, and granite in Bavaria, of clinkstone on the Rhone, of basalt in Vogelsberge, and of clay-slate on the Rhine and Eifel, the finest forests of other trees which cannot be produced on the sandy or calcareous soils upon which pines thrive. It is explained by the fact, that trees, the leaves of which are renewed annually, require for their leaves six to ten times more alkalies than the fir-tree or pine, and hence, when they are placed in soils in which alkalies are contained in very small quantity,

do not attain maturity.* When we see such trees growing on a sandy or calcareous soil—the red-beech, the service-tree, and the wild-cherry, for example, thriving luxuriantly on limestone, we may be assured that alkalies are present in the soil, for they are necessary to their existence. Can we, then, regard it as remarkable, that such trees should thrive in America, on those spots on which forests of pines which have grown and collected alkalies for centuries, have been burnt, and to which the alkalies are thus at once restored; or that the *Spartium scoparium, Erysimum latifolium, Blitum capitatum, Senecio viscosus,* plants remarkable for the quantity of alkalies contained in their ashes, should grow with the greatest luxuriance on the localities of conflagrations.†

Wheat will not grow on a soil which has produced wormwood, and, *vice versa,* wormwood does not thrive where wheat has grown, because they are mutually prejudicial by appropriating the alkalies of the soil.

One hundred parts of the stalks of wheat yield 15·5 parts of ashes (*H.Davy*); the same quantity of the dry stalks of barley, 8·54 parts (*Schrader*); and one hundred parts of the stalks of oats, only 4·42; —the ashes of all these are of the same composition.

We have in these facts a clear proof of what plants require for their growth. Upon the same field, which will yield only one harvest of wheat, two crops of barley and three of oats may be raised.

All plants of the grass kind require silicate of potash. Now this is conveyed to the soil, or rendered soluble in it by the irrigation of meadows. The *equisetaceæ,* the reeds and species of cane, for example, which contain such large quantities of siliceous earth, or silicate of potash, thrive luxuriantly in marshes, in argillaceous soils, and in ditches, streamlets, and other places, where the change of water

* One thousand parts of the dry leaves of oaks yielded 55 parts of ashes, of which 24 parts consisted of alkalies soluble in water; the same quantity of pine leaves gave only 29 parts of ashes, which contained 4·6 parts of soluble salts. (*De Saussure.*)

† After the great fire in London, large quantities of the *Erysimum latifolium* were observed growing on the spots where a fire had taken place. On a similar occasion, the *Blitum capitatum* was seen at Copenhagen, the *Senecio viscosus* in Nassau, and the *Spartium scoparium* in Languedoc. After the burnings of forests of pines in North America poplars grew on the same soil. (*Franklin.*)

renews constantly the supply of dissolved silica. The amount of silicate of potash removed from a meadow, in the form of hay, is very considerable. We need only call to mind the melted vitreous mass found on a meadow between Manheim and Heidelberg after a thunder-storm. This mass was at first supposed to be a meteor, but was found on examination (by *Gmelin*), to consist of silicate of potash; a flash of lightning had struck a stack of hay, and nothing was found in its place except the melted ashes of the hay.—*Liebeg's Organic Chemistry of Agriculture and Physiology.*

Notice upon the cultivation and preparation of Tobacco. Published by direction of the Commission appointed by the Spanish Government.

Translated and Communicated to the Ceylon Agricultural Society, by JOSIAS LAMBERT, *Esq. F. G. S. V. P.*

Tobacco flourishes in rich, cool and dry soils, and also in those of a stony or sandy nature, provided there be a foot depth of vegetable mould—Virgin forest land, and old meadows, will produce excellent crops for many years without manure. If the soil have borne other crops previously, it must have a six months' fallow, and be well manured. All descriptions of manure are good, but preference should be given to the dung of sheep or goats: that of the horse and horned cattle is the next best, and the older the better.

There are many sorts of Tobacco, but the best yet known is that grown in Cuba, commonly called Havana Tobacco.

The seed beds should be carefully prepared with fine mould which has been well worked, and before sowing, the surface must be pressed down with a light roller, the flat of a spade, or a board, in order that the seed may not sink into the soil upon the first watering, which is immediate and indispensable from a fine rosed pot. It is necessary to mix the seed which is extremely small, with three or four times as much sand, ashes, or fine mould, in order that the plants may not spring too thickly, and care must be taken that the seed be not covered more than a quarter of an inch deep:—frequent waterings and weedings are necessary in these beds, and transplanting should not take place until four or five leaves be fully developed.

This operation must be preceded by a copious watering the day previous, in order that the plants may be easily removed without breaking, and that a portion of the soil adhere to the roots.

The plants should be placed in rows, at three feet apart, those of one row being opposite to the spaces in the other.—A few days after transplanting, the ground will be covered with young weeds, which must be carefully cut up by means of a small crooked hand hoe. This operation must be repeated as often as necessary, until the plant shall have acquired sufficient strength to choke the weeds by its own luxuriance.—Not less important is the hoeing up the soil round the plants, as much as possible; well managed, this operation gives it great strength and facilitates the irrigation which must constantly be practised.

The moment the flower bud appears, it must be removed, and so on in succession with every one which is presented, the object in this case being to cause all the sap to be delivered to the leaves; this process will however induce the shooting of new leaves which must be carefully removed as soon as they appear.

From the period of destroying the flower buds until the ripening of the leaves, five or six weeks will elapse, according to the season, climate, and aspect of the ground.

Having spoken of the flower stopping, it is necessary the planter should recollect that he ought to leave some plants for the purpose of bearing seed: the finest and strongest should be reserved with this view, and very few are required, as each will produce at least 30,000 grains, and many authors assert that a single plant will give 300,000.—It is unnecessary to state that these plants exact much care in their cultivation, and therefore the zealous planter generally has them in a garden close to his house, where he can give them his particular attention.

Among the various signs of the ripeness of the leaf, the most characteristic are the following; a change of colour, and the loss of that lively and equal green, they have hitherto maintained, assuming a marbled appearance, with irregular spots of a yellowish colour; a blistery and shrivelled texture, bending downward; and finally, becoming rough to the touch, and so brittle that in folding down, even the thinnest part of the leaf, it will immediately crack.

The harvest is collected either in leaves or in the whole plant.

The first method, viz. that of the leaves, is commenced by taking off those nearest the ground, as follows; the thumb of the right hand is placed upon the upper part of the leaf-stalk, and the fore-finger a little bent on the lower side, as close to the main stalk as possible; a very slight effort downwards, detaches the leaf without bringing away any bark from the trunk. As they are removed from the plant, the gatherer places them upon his left arm, one over the other, the upper side of one leaf always in contact with the underside of the following, until he can carry no more; he then lays them on the ground in a line, the other men following in the same line, placing their bundles in succession, taking care that they be laid upon their edges, and not one upon the other as they had been upon the arm, in the first place, because the leaves in the centre of the bundle would heat, and next, it is more easy to collect them for carrying off the field, than if they were disposed of here and there, all over the ground. It must not be lost sight of, that only those leaves which are perfectly ripe should be gathered; the remainder will come on in a few days, and attention to this point is so essential that occasion may occur in certain seasons to gather at three or more periods.

Taken to the drying houses, either in carts or on the backs of cattle, wrapt up in cloths or mats, or on hand barrows, the motion of which, being gentle, is by far the most preferable mode,—the leaves are placed on the floor, the stalks downwards, close together, but not packed;—a boarded floor, well raised by beams underneath, is the best for the purpose, but in the event of brick, stone, or earth alone being available, a bed of straw must intervene, in order that moisture may not communicate an injurious effect. In this state the leaves may remain two or three days, during which time they heat and begin to take a yellow colour. This is called the sweating process, which causes them to lose a considerable portion of the water of vegetation, renders them flexible, less brittle, and more easy to be strung, which is the next operation; for which purpose flat needles of 4 or 6 inches long are used, and the twine must be strong and well twisted, the length may be proportionate to that of the building, or the beams to which they are hung, and strength of the twine,

but in general three or four yards is sufficient, and they are suspended from hooks or nails in the beams. Some planters, to save expense of needles and twine, string with sallow wood, others leave a piece of the trunk bark upon the stalk of the leaf, and make use of this as a hook to hang it upon cords already fixed, and many simply tie two leaves together by the trunk bark, and so hang them on the drying lines: these last have also the object of augumenting the weight of their crop.

The second method of cropping, consists in taking off the whole plant at once. The workman lays hold of it near the bottom, bending it gently outwards with the left hand, and cuts it off with a pruning knife, from below upwards, as near to the ground as possible; he leaves them on the spot, taking care that the cut ends lie in the direction of the wind, and that the leaves be not broken or doubled over. A clever workman will cut three hundred plants in an hour. Two or three adjoining rows may be collected into one line of cut plants, and this operation should be performed in the morning, in order that the plants be housed on the same day, and thus avoid exposure to fog, dew, or rain, during the night. Three or four hours after cutting, the workmen are employed in tying two plants together, by their lower ends, with sallow, (or jungle bind,) without moving them from where they lie, and disturbing them as little as possible. Twine may be used, but bind is better, as the stalks in this case are more separate.—Thus tied together in a line, it is very easy to gather and place them in carts, or upon hand barrows, to carry to the drying house, and the leaves being now dead, they do not suffer in this operation,—taking equal care in the removal from the carts or barrows they are allowed to sweat the same time, and are then hung up on ropes.

In either of the preceding methods of cropping, the remaining attention of the planter is directed to form bundles of leaves and put them into fermentation which is the last object he has to obtain. There is a certain proof of the complete drying of the leaf, in that of the end of the stalk; another is that of squeezing it in the hand without breaking.—When these occur, the strings are detached and twine drawn out; generally twenty-five leaves are formed into a bundle, which is made up by tying one stalk round the others, a

peculiar operation, which must be seen rather than described.—The stalk cured leaves are stripped off, and made into bundles in the same manner, in each case taking care to separate the various qualities of leaf. This process going on, other workmen make piles of the bundles, placing them either in an oblong position, one over the other, with the points meeting and the stalk outwards, a yard and a half high, or in a conical form, the points always inside, but whatever the shape of the mass, it must be apart from the wall of the building, and upon boards raised from the floor, so that the free circulation of the air be not impeded; they must then be covered with cloths or mats, and weights placed upon the heap. It ought to be frequently inspected, in order to ascertain the degree of temperature, that no part be too much heated, which might cause it to take fire, or induce an undue fermentation, totally destructive to the tobacco.

This is the most difficult part in the preparation of tobacco, because its practice does not admit of any general rule, and depends entirely upon experience;—for this reason, it being impossible to designate the degree which the temperature may be allowed to reach, we limit ourselves to say, that when by introducing the hand into the heap, great warmth and moisture are perceived, it must immediately be broken down and re-made, placing in the middle those bundles which had been outside: it frequently occurs that this operation must be performed three or four times.

As soon as the violent fermentation is over, so that no more danger need be anticipated, the bundles may be lightly packed in casks, and placed in a dry and cool warehouse.

Note by the translator. Instead of a needle and twine, a strip of rattan, such as is used by chair-makers, might be economicaly employed. The cropping by leaves and stringing them, is unquestionably preferable to any other.

Remarks upon the prevailing epidemic in Cattle, June, 1842. *Communicated to the Ceylon Agricultural Society, by* JOSIAS LAMBERT, ESQ., F. G. S. *Vice President.*

Without entering into the causes in which the disease has originated —difficult in cases of this nature to assign, and utterly useless

towards remedy or cure—the author wishes to confine himself to a statement of such facts as have come under his notice, in the herd of nearly two hundred head of cattle, upon the Doombera Sugar Estate.

During many months (a period which cannot be correctly ascertained) all cattle in the Island have been attacked by the pestilence, and in the vicinity of the property above-mentioned, it has prevailed with more or less violence for at least six months, and thousands of cattle have been swept off; the immunity enjoyed upon this estate was attributed to the nature of the food (cane tops, spent wash from the stills, and an occasional dose of salt) to the absolute isolation in which the stock was kept, and to the care bestowed upon them; the results fully proved the system to be good, the cattle remaining healthy up to the period of the cessation of cane-grinding, in the middle of May. At this time the guinea-grass not being well adapted for their exclusive food, they were turned into the pasturage of the adjoining Coffee Estate of Palle-kelle, which was close ground, and here they continued healthy, being housed nightly, fed with cut guinea-grass, and littered with cane trash. The distance of the Coffee Estate pastures from the sheds, being considerable, it was determined upon grazing over the adjoining Doombera pastures, belonging to the Sugar Estate, where there was abundance of fine grass; unfortunately, this land, to the extent of 300 acres, has roads passing though it, and the native cattle have had an unlimited range over it. A few days only elapsed when the first case of sickness appeared on the 18th of June, terminating fatally within twenty-four hours. The full development of the disease took place on the 17th, on which, and the two consecutive days, sixty head of cattle died, notwithstanding the precaution of separating and bringing home all the stock; the attack being so sudden, and its extension so rapid as to bewilder the judgment—militating almost against the suggestion of a remedy, if such there could be under a visitation of this appalling nature. The food was immediately changed to cane tops, with salt: doses of oil were given, and an amelioration was perceptible, i. e. the number attacked diminished sensibly, and some of those in an incipient state of disease, rallied and recovered.

The first symptoms observed, have been, a general dullness in

the animal, sometimes fever, and always a purulent discharge from the nostrils and eyes, together with oppressed and husky respiration ; to these succeed a complete prostration of strength, inertia, and a slight evacuation of very fluid excrements ; the flanks become hollow, the chest and ribs maintain their rotundity, myriads of the blue fly attack the animal several hours before death, and he sinks, apparently without pain, having scarcely from the moment of the attack exhibited any indication of pulse, and in frequent instances, the lancet has failed to draw a drop of blood. It is remarkable that the blue fly does not approach the sick cattle which recover.

Post mortem examination exhibits the wind-pipe full of frothy mucus, the air cells of the lungs charged with the same, and inflamed in a high degree ; the heart full of coagulated blood, and together with the pericardium, in a healthy natural state. The œsophagus inflamed, and the mucous membrane one mass of pus ; the first and second stomachs without any particular affection, and containing a small portion of recent food ; the third stomach (manyplus) distended with food, and very hard ; upon opening it, the folds were found highly inflamed and the food compressed into the consistence of oil-cake ; the fourth stomach contained a small quantity of food in a semifluid state, and, together with the colon and intestines, including the rectum, manifested a high degree of inflammation ; the whole of the mucous membrane of these latter was converted into pus, which upon being removed exhibited the intestine itself in a state of incipient ulceration throughout its whole course ; the liver turgid and inflamed, gall bladder full of healthy secretion, and nothing further remarkable presented itself in the abodminal cavity.

This examination led to the immediate bleeding, to a small extent, not only of the cattle labouring under the first symptoms, but of the whole stock, together with the exhibition of about a pint of oil, gradually and gently administered, with the view of softening the hard dry food in the third stomach, and facilitating its passage ; the result has been that thirty-five head have passed through the incipient stages in safety, and are now recovered : there yet remain ten which have not experienced the attack, and it is hoped they may get through it lightly, if affected. In the commencement of the disease, Epsom

salts and ginger were given, without any effect; the former would, certainly, be injurious, and the latter could only stimulate the action of the rumen. The progress of the disease is so rapid that a remedy has scarcely time to take effect, and when advanced to a certain stage it will be impossible to check, from the difficulty of evacuating the manyplus, and arresting the extensive ulceration of the intestinal canal.

The conclusions drawn from what has been said, are that the contagion is communicated by depasturage upon land where infected cattle have grazed, and that the propagation of the disease is not induced by atmospheric influence; it may also be assumed that actual contact will cause its developement.

Excessive bleeding is found to be prejudicial, whilst the moderate extraction of a pint and a half, in some cases, relieves the animal considerably, and the use of oil, in doses of half a pint, at intervals as occasion may require, gently administered, so that it may find its way into the manyplus without reaching the rumen, should not be omitted. Hogs' lard, which was recommended some time since, will produce a similar effect, provided it be given in a fluid state, so as not to fall like a pellet through the œsophagus, which would inevitably open the pillars of the rumen, and being introduced there would be of no use.

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August, 1842.

Days of the Month.	MINIMUM TEMPERATURE, Observed at Sun rise. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches	o	o	o		
1	29.426	82.0	80.2	80.5	W S. W.	Raining,
2	.473	80.7	78.9	79.0	S. W. ..	Nimbi,
3	.493	81.5	80.8	80 0	S. W. ..	Nimbi,
4	.506	80 8	79 5	79.5	S. S. W.	Cloudy,
5	.530	81.0	77.8	78.0	S. W. ..	Cloudy,
6	.537	80.2	77.9	78.1	Calm, ..	Nimbi,
7	.542	82.2	80.8	80.0	S.	Cirro-strati,
8	.497	82.0	80 0	80.0	S..	Cirro-Cumuli,
9	.454	81.3	79.8	78.0	Calm, ..	Nimbi,
10	.497	83.0	79.8	80.0	Calm, ..	Cloudy,
11	.538	82.0	80.0	80.2	Calm, ..	Cloudy,
12	.541	82.8	80.2	80.0	S. E. ..	Cloudy,
13	.577	82.0	80.0	79.9	S. E. ..	Cloudy,
14	.553	83.6	82.2	81.9	S. W. ..	Cloudy,
15	.586	79.5	77.9	78.0	S. W. ..	Nimbi,
16	.638	81.0	79.0	78.5	S.......	Cloudy,
17	.685	80.5	79.8	79.9	S.......	Overcast,
18	.650	81.8	80.2	81.0	S...... ..	Cloudy,
19	.617	81.8	79.6	80.0	Calm, ..	Cloudy,
20	.682	80.8	78.8	79.2	Calm, ..	Cirro strati,
21	.598	81.0	79.5	79.6	E......	Cirro-strati,
22	.589	81.1	79.6	79.3	E..... ..	Nimbi,
23	.570	82.5	79.4	79.0	S. E. ..	Cloudy,
24	.553	82.7	79.9	80.2	Calm. ..	Nimbi,
25	.541	82.3	80.0	80.4	E.......	Cumulo strati,
26	.569	82.0	80.0	80.0	E... ..	Cirro-Cumuli,
27	.549	81.8	79.0	79.0	E.	Light Cirro-strati,
28	.494	81.0	79.0	79.0	E.	Cloudy,
29	.570	81.4	78.0	79.0	E.	Cirro strati,
30	.630	81.0	78.0	78.6	Calm, ..	Light Cirro strati,
31	.600	82.2	80 0	80.0	Calm, ..	Cirro-strati,
Mean.	29.554	81 6	79.5	79.5		

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August, 1842.—*(Continued.)*

	MAXIMUM PRESSURE. Observed at H. 9. M. 50					
		Temperature.			Wind.	
Days of the Month.	Barometer.	Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.458	82.1	80.6	80.4	W. S. W..	Nimbi,
2	.515	80.2	79.2	79.0	S. W.. ..	Raining,
3	.542	82.8	84.0	81.3	W........	Cloudy,
4	.570	82.0	83.2	81.0	S. W.. ..	Cloudy,
5	.565	82.4	82.0	82.0	S...... ..	Cloudy,
6	.593	82.0	83.8	81.0	Calm,.. ..	Cloudy,
7	.573	83.5	85.4	82.9	S. W.. ..	Cirro Cumuli,
8	.533	85.1	87.2	84.0	S....	Cumuli,
9	.498	82.8	83.0	81.8	Calm.. ..	Cloudy,
10	.567	83.5	84.8	82.8	W........	Nimbi,
11	.574	83.0	85.2	83.3	Calm,.. ..	Cloudy,
12	.586	82 4	83.2	82.0	S. W.. ..	Cloudy,
13	.610	83.5	85.2	83 5	S.	Cloudy,
14	.606	84.8	85.2	82.8	S. W.. ..	Cloudy,
15	.650	83.0	83.4	82.0	S....	Nimbi,
16	.718	83.2	83.8	82.6	S.........	Nimbi,
17	.713	83.0	84.5	82.0	S....	Cumuli,
18	.678	83.1	84.0	82.2	S.........	Nimbi,
19	.654	82.5	85 3	83.0	S.........	Cumulo-strati,
20	.637	83.2	85.0	82.7	E....	Cloudy,
21	.633	84.2	87.8	84.9	N. E... ..	Cumuli,
22	.622	83 8	84.2	81.9	S. E.. ..	Raining,
23	.600	83 8	86.5	82.6	S.........	Cumuli,
24	.576	83 5	86.5	84.0	W........	Cumulo-strati,
25	.581	84.0	87.8	84.0	E....	Cumuli,
26	.600	84.9	87.2	84.0	E....	Cumuli,
27	.573	85.1	87.2	84.0	E....	Cumuli,
28	.525	84.0	86.0	83.0	E....	Cumuli,
29	.615	83.0	84.6	83 0	E...	Nimbi,
30	.678	82.9	86.4	83.0	S. E... ..	Cumuli,
31	.635	86.0	88.5	86.0	E...... ..	Cumulo-strati.
Mean.	29.597	83.8	84.9	82.7		

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August 1842.—(Continued.)

Days of the Month.	OBSERVATIONS, Made at Apparent Noon.					
	Barometer.	Temperature.			Wind.	Aspect of the Sky.
		Of the Mercury.	Of the Air,	Of an Evaporating Surface.	Direction.	
	Inches.	o	o	o		
1	29.442	82.1	81.0	81.0	W.	Nimbi,
2	.506	82.4	82.9	82 0	S. W.... ..	Nimbi,
3	.522	81.1	85.8	83.0	S. W... ..	Cloudy,
4	.554	84.8	86.3	83.2	S. W.. ..	Cirro Cumuli,
5	.557	83.8	84.8	84.0	S...... ..	Cloudy,
6	.581	83.1	84.2	82.0	S....... ..	Nimbi,
7	.550	85.1	88.2	84.2	S....	Cloudy,
8	.505	86.2	88.6	84.7	W. S. W..	Cumuli,
9	.494	84.5	84.0	82.2	W. S. W..	Raining,
10	.546	83.8	85.0	84.0	Calm,.. ..	Cloudy,
11	.558	84.8	84.5	82.6	S. W... ..	Cloudy,
12	.570	84.0	85.8	83.7	S. W.. ..	Cloudy,
13	.596	85.4	87.5	84 8	S. W.. .	Cumulo-strati,
14	.593	86.0	87.2	84.0	S. S. W..	Cirro Cumuli,
15	.630	85.1	86.5	84.0	S. W.. ..	Cloudy,
16	.713	81.8	78.1	77.9	W...	Drizzly,
17	.705	84.4	84.5	88.3	S.... ...	Drizzly,
18	.661	84.5	86.0	84.0	S....... ..	Cloudy,
19	.645	84.0	85.0	82.8	S.... ...	Nimbi,
20	.618	82.1	82.2	82.0	E....	Nimbi,
21	.618	83 8	85.0	83.4	E....	Cumulo strati,
22	.602	85.6	86.5	82.7	S. E... ..	Cumulo strati.
23	.579	86.0	88.2	84.0	S....	Cumuli,
24	.554	85.3	88.4	86.0	Calm... ..	Cloudy,
25	.558	88.5	90.0	86.0	N.E.	Cumuli,
26	.589	82.5	80.6	81.0	E....	Raining Thunder,
27	.554	87.5	89.1	85.8	E...... ..	Cumuli,
28	.502	84.4	86.0	83.0	E...... ..	Cloudy,
29	.622	82.4	80.0	80.5	S. E... ..	Raining,
30	.658	85.7	89 0	85.0	S. E......	Cumulo-strati.
31	.618	87.1	89.0	85.4	E.........	Cloudy and Haze,
Mean.	29.581	84.5	85.5	83.3		

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August 1842.—*(Continued.)*

MAXIMUM TEMPERATURE
H. M.
Observed at 2 40

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Thermometer exposed to the Sun's rays.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o	o		
1	29.425	82.2	81.0	81.0	84.0*	W.	Raining,
2	.482	84.0	86.5	82.5	103.0	S. W.	Cirro-strati,
3	.494	84.5	84.6	83.0	84.0*	S. W.	Nimbi,
4	.587	86.0	87.0	88.4	100.0	S. W.	Cloudy and Haze.
5	.530	85.0	87.8	84.2	99.0	S.	Cumuli and Haze.
6	.549	83.0	88.9	81.0	84.0*	W S W.	Nimbi,
7	.514	85.2	88.0	85 0	100.0	S S W.	Cumuli,
8	.461	87.8	90.7	85.8	112.0	S.	Cumulo-strati,
9	.473	83.0	82.0	82.0	84.0*	N. W.	Raining,
10	.522	83.8	85.9	82.8	96.0*	Calm.. ..	Cloudy,
11	.534	82.4	81.8	81.7	84.0*	Calm.. ..	Drizzly,
12	.538	85.2	88.5	84.0	113.0	S.	Cumulo strati,
13	.558	87.1	90.0	85.0	114.0	S. W.	Cumuli,
14	.569	86.0	86.1	84.0	92.5*	S.	Cloudy,
15	.608	84.5	85.2	83.0	95 0	S.	Cloudy partially,
16	.657	79 4	77.0	78.0	81.0*	S.	Raining,
17	.650	85.1	87.0	84.0	108.0	S.	Cumuli,
18	.610	83.2	83.2	82.4	84.0*	S.	Cloudy,
19	.600	82.8	83.2	82.1	92.0*	Calm.. ..	Cloudy,
20	.582	83.5	85.2	83.6	104.0	S.	Cumulo-strati
21	.590	85.5	87.0	84.7	113.0	E.	Cumulo-strati,
22	.578	86.0	87.0	82.5	112.0	S. E.	Cumulo-strati,
23	.560	85.0	88.0	83.8	108.0	S.	Cirro-strati,
24	.509	84.2	86.7	84.0	102.0	S.	Cirro-strati,
25	.526	87.0	86.0	84.2	88.0*	N. E.	Nimbi,
26	.548	82.8	82.0	81.0	85.0*	E.	Cloudy,
27	.494	86.8	92.0	86.2	115.0	E.	Cumulo-strati,
28	.485	82.3	81.5	82.0	84.0*	E.	Drizzly,
29	.593	83.9	86.4	83.7	118.0	S. E.	Cirro-strati,
30	.618	85.8	90.5	87.4	112.0	S. E.	Cloudy partially,
31	.557	86.0	87.0	84.2	100.6*	S. E.	Cloudy and Haze,
Mean.	29.546	84.5	85.7	83.3	98.3		

N. B. The Asterisks in the column giving the temperature of the Sun's Rays signify that a Cloud intervened between the Sun and the Thermometer at the time of Observation.

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August, 1842.—(Continued.)

MINIMUM PRESSURE,

Observed at 4 P. M.

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.409	82.1	81.0	81.0	W S. W.	Drizzly,
2	.478	85.1	85.9	83 0	S. W.. ..	Cumuli,
3	.493	83.0	80.0	80.0	S.........	Heavy Rain,
4	.525	85 0	86.2	83 6	S. W......	Hazy,
5	.521	86 2	88.0	84.6	S.........	Cumuli,
6	.530	83.4	84.0	81.2	S. W.. ..	Cloudy,
7	.489	85.2	87.2	82.8	S, ...	Generally Clear,
8	.445	88.2	90.0	84.5	S.	Cumulo strati,
9	.462	82.1	81.0	80.5	Calm,.. ..	Drizzly Thundering,
10	.514	84.0	84.6	82.9	Calm, ...	Cloudy,
11	.522	82 0	81.0	81.0	Calm... ..	Drizzly,
12	.530	86.0	88.0	84.0	S. W.. ..	Scattered Clouds,
13	.549	86.5	88.5	85.0	S....	Cumulo strati,
14	.587	85 2	85.0	83.0	S....... ..	Cloudy,
15	.593	85.3	85.8	84.0	S....	Nimbi,
16	.650	80.0	77.9	78·0	S....	Drizzly,
17	.650	84.8	85.4	83.0	S.	Cumuli,
18	.602	83.0	82.2	82.0	Calm... ..	Nimbi,
19	.561	84.1	87.0	84.0	S. E... ..	Cumulo strati,
20	.56..	83.8	84.6	82.8	S. E.	Cloudy,
21	.578	84.4	85.0	83 0	E....	Cumulo strati,
22	.557	86.3	87.8	82.8	S. E.. ..	Cumulo-strati,
23	.538	85.8	88.2	86.0	S..	Cloudy,
24	.494	85.5	88.0	85.0	E....	Cumulo-strati,
25	.522	84.8	84.5	83.0	E....... ..	Cloudy,
26	.537	83.8	84.0	82.0	E....... ..	Cirro strati,
27	.473	87.0	86.(	85 0	E....	Nimbi,
28	.458	81.2	80.0	80.5	E	Cloudy,
29	.582	82.4	83.8	82.6	S. E	Cloudy,
30	.600	85.4	89.0	87.2	S. E.....	Cloudy,
31	.550	86.0	88.4	83 8	E.... .. .	Cloudy Cumulo strati,
Mean.	29 535	84.1	85.1	83.0		

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of August 1842.—*(Concluded.)*

Days of the month.	OBSERVATIONS, Made at Sun set						Rain Gauges.		Moon's Changes.	Moon's Horizontal Parallax at Noon	Days of the Month.
	Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.	Upper.	Lower.			
	Inches	o	o	o			Inches	Inches			
1	29.420	81.5	80.2	80.0	W. S. W..	Cloudy,	0.87	1.14		57	1
2	.478	84.2	84.0	82.4	S W.....	Rain.	0.08	0.15		58	2
3	.499	81.0	78.8	78.9	S. W.....	Raining,	2.97	3.30		59	3
4	.530	84.0	84.0	82.9	S..... ..	Nimbi,	1.57	1.78		59	4
5	.525	82.4	80.1	79.0	S. W.....	Nimbi,				60	5
6	.530	83.5	83.3	81.8	S. W.....	Cloudy,			●	61	6
7	.500	84.2	84.5	82.0	S...	Cloudy,				61	7 S.
8	.445	83.0	82.0	81.5	Calm, ..	Raining,	2.56	2.96		61	8
9	.462	80.8	80.0	79.0	Calm, ..	Nimbi,	0.61	0.73		60	9
10	.526	83.5	84.0	83.0	Calm, ..	Cloudy,	0.27	0.34		60	10
11	.522	82.2	81.3	81.2	Calm, ..	Cloudy,	0.11	0.16		59	11
12	.538	84.2	84.0	82.3	Calm, ..	Cloudy,	0.67	0.87		58	12
13	.558	84.3	84.2	82.0	S...	Nimbi,			☽	57	13
14	.558	84.8	84.8	83.0	S.	Cloudy,	1.16	1.36		57	14 S.
15	.603	82.0	78.5	78.7	N. W. ..	Raining,	4.05	4.75		56	15
16	.650	79.5	77.0	77.8	S..... ..	Cloudy,	1.46	1.57		55	16
17	.654	82.7	80.0	80.2	Calm, ..	Nimbi,	0.05	0.09		55	17
18	.613	81.9	80.8	80.0	S...	Cirro-strati,				55	18
19	.570	83.6	84.1	82.9	Calm, ..	Cloudy,	0.24	0.32		54	19
20	.557	88.2	83.0	82.7	E..... ..	Cloudy,	0.54	0.64		54	20
21	.579	84.0	82.7	81.0	E..... ..	Cloudy,	0.15	0.23	○	54	21 S.
22	.562	83.9	83.0	82.4	S. E.	Nimbi,	0.05	0.08		54	22
23	.540	84.8	83.4	82.4	S. E.. ..	Cloudy,	0.16	0.21		54	23
24	.508	85.0	85.0	83.0	S. E.	Cloudy,				54	24
25	.528	84.4	83.7	82.0	E..... ..	Cloudy,				54	25
26	.537	83.0	83.8	82.9	E...	Cloudy,	0.45	0.54		55	26
27	.474	85.8	86.2	84.2	N. E. ..	Nimbi,	0.19	0.23		55	27
28	.478	82.0	80.0	80.0	E...	Nimbi,	0.32	0.38		56	28 S.
29	.592	82.3	80.6	80.4	S. E.. ..	Cloudy,	0.08	0.13	☾	57	29
30	.593	84.5	85.4	85.0	Calm, ..	Nimbi,				58	30
31	.550	81.8	83.9	82.7	S. E.. ..	Cloudy, (Cirro Cumuli,)				59	31
	29.538	83.4	82.4	81.5			18.61	21.97			

Proceedings of the Society.

A General Meeting was held at the Town Hall, on Wednesday the 14th September, 1842.

The Hon'ble Sir John P. Grant, President in the chair.

(*Forty-four Members present,*)

The Proceedings of the last Meeting were read and confirmed.

The gentlemen proposed at the last Meeting were elected Members, viz.

Captain J. A. Currie, Messrs. A. T. Dick, Andrew Hay, C. Allen, W. N. Hedger, and R. S. Maling.

CANDIDATES FOR ELECTION.

The names of the following Gentlemen were submitted as candidates for election :

Capt. Hamilton Vetch, Political Assistant in Upper Assam,—proposed by the President, seconded by Dr. Corbyn.

T. J. Finnie, Esq., in charge of Government Cotton Plantation at Kotra,—proposed by the President, seconded by Dr. Corbyn.

E. McDonell, Esq., Sub-Deputy Opium Agent, Champarun,—proposed by Mr. W. Moran, seconded by Dr. Corbyn.

James Hill, Esq., Merchant, Calcutta,—proposed by Mr. D. C. Mackey, seconded by Mr. Willis.

Henry Brownlow, Esq., Civil Service, Cuttack,—proposed by the President, seconded by Dr. Corbyn.

M. Shawe, Esq., Commissioner of the Soonderbunds,—proposed by Mr. Robert Torrens, seconded by Mr. Chas. Bury.

R. P. Harrison, Esq., Civil Service, Malda,—proposed by Mr. Robert Torrens, seconded by Mr. Bury.

S. H. Robinson, Esq., of Dhoba Factory, near Culna,—proposed by Mr. Frederick Nicol, seconded by Dewan Ramcomul Sen.

Baboo Ramnauth Tagore,—proposed by Mr. Piddington, seconded by Mr. Dubois.

A. Sevestre, Esq., Calcutta,—proposed by Mr. Piddington, seconded by Mr. Dubois.

PRESENTATIONS TO THE LIBRARY.

1.—A pamphlet on the production of Isinglass along the Coasts of India, with a notice of its Fisheries. By Professor Royle.—*Presented by Government.*

2.—The first number of the Proceedings of the Ceylon Agricultural Society.—*Presented by the Society.*

3.—The Planter's Journal, Nos. 7 to 11.—*Presented by Mr. G. T. F. Speede.*

4.—The Calcutta Literary Gleaner, No. 7.—*Presented by the Proprietor.*

5.—The Table Fruits of India, Nos. 3 and 4.—*Purchased by the Society.*

ELECTION OF VICE-PRESIDENTS.

The Honorable the President opened the business of the day by stating, that agreeably to the resolution of the last Meeting, the first question for the consideration of Members was the appointment of two Vice-Presidents to supply the vacancies caused by the death of the Nawaub Tahower Jung, and the resignation of Mr. C. K. Robison.

He would propose, if it should meet the approbation of the Meeting, that Dr. John Grant and Dewan Ramcomul Sen be requested to accept the office of Vice-Presidents of the Society.

The proposition was put to the vote and carried unanimously.

The President having previously expressed his deep sense of the loss the Society had sustained in the death of its late Secretary, Dr. Spry, and of the merits of that excellent person, both as an officer of this Society, and as a member of the community, would propose that the election of a gentleman to succeed him as Secretary should be fixed to take place at the Meeting of the Society in November next, in order to allow time for such gentlemen to appear as candidates who might be disposed to come forward.

This was put to the vote and carried unanimously.

The President then said that he had enquired into the probable amount and nature of the business to be done during the next two months, and he found there was none which could not be perfectly well conducted by the Deputy Secretary and which that Gentlemen was willing to undertake. He thought, therefore, it unnecessary to appoint any person to act as Interim Secretary until the election should take place; although he ought to mention that some of the Members had very handsomely offered their services *ad interim* gratuitously.

This suggestion was unanimously concurred in by the Meeting and no Interim Secretary was appointed.

TRIBUTE OF RESPECT TO THE MEMORY OF THE LATE SECRETARY OF THE SOCIETY.

In returning his thanks to the Meeting, for the honor conferred by his election as Vice-President of the Society, Dr. Grant said he would take the opportunity of expressing his cordial concurrence in what fell from the President, relative to the death of their late amiable and excellent Secretary;—he conceived, however, the Society ought not to be satisfied with a mere verbal expression from individuals, but that an expression of regret for the loss it had sustained, ought to be placed on record;—and he would therefore beg to move the following resolution:—

"That this Society on holding its first meeting after the lamented and unexpected death in the prime of life and well directed energies, of its late able and zealous Secretary, Dr. Henry Harpur Spry, is desirous to place on solemn record, its deep regret at an event that has deprived this institution of a most assiduous and valuable functionary, and Society at large, of a truly estimable, useful and benevolent member."

The above Resolution was seconded by Dr. Corbyn, and carried unanimously.

Dr. Corbyn addressed the Meeting at some length, on the great zeal and acquirements of the late Secretary, and concluded by giving the following notice of motion for consideration at the next general meeting:—

"That as a mark of the deep sense, this Society entertain of the valuable exertions and zeal of their late Secretary Dr. Spry, a Gold Medal, to be entitled the "*Spry Medal*," shall be given by the Society to such persons who may emulate his bright example for zeal in developing the Agricultural resources of India."

SUBSCRIBERS IN ARREAR.

The motion which was postponed at the last Meeting, owing to the absence of the Mover, to the effect, "that the Finance Committee have the power to revise from time to time the list of subscriptions in arrear, and that they be empowered to publish periodically the names of those defaulters, the recovery of whose subscriptions is hopeless," was then read,—supported by Mr. Hume and unanimously agreed to.

PUBLICATION OF THE NEW MONTHLY JOURNAL.

The motion of which notice was given by Mr. Piddington at the last Meeting, viz., "that the publication of the New Monthly Jour-

nal be deferred until after the Annual Meeting," was then read. Mr. Piddington spoke in support of his motion and was answered by Mr. Hume. Mr. Piddington replied. The question was put and the motion was negatived.

REMUNERATION TO THE SECRETARY AND DEPUTY SECRETARY.—NEW JOURNAL OF THE SOCIETY.

Mr. Huffnagle gave the following notice of motion for consideration at the next Meeting :—

Moved by Mr. Huffnagle, seconded by Dr. Grant " that the Secretary of the Society and Editor of the Monthly Journal pay to the Assistant Secretary the sum of one hundred rupees per month from the proceeds of the Journal derived from the additional eight rupees levied from subscribers."

Dr. Corbyn gave notice of the following amendment which was seconded by Mr. Piddington :—

" That the Monthly Journal be considered the property of the Society and that the Secretary's salary in remuneration for his labour in conducting it be encreased from 300 to 400 rupees per mensem, and instead of 8 rupees per annum being considered a distinct charge for the Journal that the quarterly subscription of each member be encreased from 8 to 10 rupees."

It was moved by Mr. Staunton, and seconded by Mr. Byrne and resolved. " That a Special Meeting be held on the first Wednesday in October 1842 to take into consideration the proposition of Dr. Huffnagle and the amendment of Dr. Corbyn."

NEW JOURNAL.

The question was put on the following Propositions relative to the New Monthly Journal and the same were carried unanimously.

1st. Moved by Dr. Grant and second by Dr. Huffnagle,—" That the Committee of Papers be requested to carry on the Monthly Journal until the election of a Secretary."

2d. Moved by Dr. Corbyn, and seconded by Dr. Huffnagle,— " That Dr. Mouat be requested to act as a member of the Committee of Papers until the election of a Secretary."

3d. Moved by Mr. Hume, and seconded by Dr. Huffnagle.— That it is very desirable that in the election of a successor to the late Secretary Dr. H. H. Spry, a gentleman should be chosen able and willing to carry out the New Monthly Journal, and that the several candidates for the vacant office be requested to state in writing to the Society, through the Deputy Secretary, whether they are prepared to undertake the editing of the work."

AMERICAN GARDEN AND COTTON SEEDS.

A report from the Finance Committee, in accordance with the Resolution passed at the last Meeting "that the matter under discussion relative to the consignment of seeds from America referred to it to report its opinion" was then read.

The Committee states that having had before it the correspondence which has taken place, and having had the benefit of the personal explanations offered by the Secretary on the occasion, begs leave to suggest that the Cotton as well as the vegetable seeds be taken by the Society if in a merchantable condition.

It was moved by Dr. Grant, seconded by Mr. Speede and resolved that the report of the Committee be confirmed.

Mr. Piddington moved, seconded by Dr. Corbyn, and resolved that it was a portion of the Tenessee Cotton seed be sent to Dr. Wight at Coimbatore and to the Superintendent of the cotton plantations at Bombay.

SOCIETY'S NURSERY GARDEN.

A second report of the proceedings of the Finance Committee at its Monthly Meeting held on the 12th instant, was read.

The Committee states that it has sanctioned the payment of all the bills submitted by the Treasurer, with the exception of the bill for the Nursery, and calls the attention of the Society to the circumstance of the Overseer of the Nursery being now uncontroled in his disbursements, in consequence of the departure of Dr. Wallich, who interested himself, as Superinten dent of the Botanic Garden, and as Vice-President, in the supervision of the expenditure. The Committee submits to the Society that some other control should be appointed, and suggests an application to the Acting Superintendent, Dr. Voigt, on the subject.

It was moved by Dr. Grant, seconded by Mr. Speede and resolved,—"That the report of the Committee be confirmed and that Dr. Voigt be solicited to give the Society the benefit of his services."

REPORT OF PROGRESS TOWARDS A TESTIMONIAL TO THE LATE REV. DR. CAREY.

The Deputy Secretary intimated to members the satisfactory progress which had been made in the subscription for a Bust to the memory of the Founder of the Institution. Since the last Meeting of the Society one hundred and nineteen names had been added to the list, and the subscripton now amounted to eleven hundred and ninety rupees.

Moved by Dr. Grant, seconded by Dr. Mouat, and resolved, "that the Finance Committee be requested to arrange all the details for carrying into effect the intentions of the Society in respect to the Testimonial."

SUGAR CANE DISTRIBUTION—GARDEN SEEDS.

A memorandum from the Overseer of the Nursery shewing the quantity of Sugar Cane which will shortly be ready for cutting, was read. It stated, that owing to the late severe gale the cultivation had sustained so much damage that there was little probability of the supply of Canes this season exceeding sixteen thousand or about one third of the quantity distributed last year.

It was moved by Mr. Speede, seconded by Dr. Grant and resolved, "that the distribution shall commence from and after the 15th of November next, and that a charge shall be made of one anna per cane including straw bands for securing the bundles."

The Deputy Secretary mentioned that a small supply of garden seeds from England, procured through the friendly agency of Dr Royle, had just been received and would shortly be ready for distribution. He further stated that as there was a small surplus from the consignment of seeds received from the Cape, the same might perhaps be made available to the public by purchase. This suggestion was adopted and it was resolved that the same charge be made as on former occasions.

LETTER FROM THE LATE PRESIDENT.

A letter from the late President of the Society was read acknowledging the receipt of the late Secretary's letter of the 20th April last informing him of the wish of the Society that he should sit for a full length Portrait, to be placed in the rooms of the Institution in the Metcalfe Hall. Sir Edward Ryan, in reply intimates that he feels "deeply sensible of the kind and flattering manner in which the Society has been pleased to regard his services for so many years as their President and that he will most cheerfully comply with their request." He regrets, however, he cannot do so before his return from the Continent, which will not be until next year. Sir Edward adds he has ascertained that the amount (£474) placed at his disposal will be quite sufficient to cover the expences of a full length portrait and frame, the portrait to be executed by the first artist of the day.

Moved by Dr. Grant, seconded by Mr. Hume and resolved, "That an account of to-day's proceedings to be drawn up by the Deputy Secretary, be published in the papers of Calcutta, Madras and Bombay.

THE

MONTHLY JOURNAL

OF THE

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

VOL. I. NOVEMBER 1842. No. IV.

On the Climate, Soil, and Agricultural Capabilities of the Province of Benares. By MAJOR HENRY CARTER.

In attempting an Essay on any portion of Indian Agriculture, we have not many steps to trace upwards, from the rude implements now in use, to the pointed stick, with which the first farmers may be supposed to have scratched a drill, or dibbled a hole, for the reception of their seed; yet, notwithstanding the roughness of their implements, the natives are by no means so deficient in practical and theoretical knowledge as their rudeness would indicate; their exertions are, however, sadly checked by the poverty of the whole rural population, which not only prevents their expending sufficient labor and expence on cultivation in general, but absolutely destroys the very heart's blood of agriculture, by converting nearly all the manure of the country into fuel: not that they are ignorant of its use or insensible to the value of manure, for on their most valuable crops, Sugar, Opium, and Tobacco, they carefully sprinkle whatever ashes and other refuse they can collect, and freely use, when permitted, the manure accruing at Indigo factories. The natural fertility of the soil and

climate somewhat counterbalances this loss; but the general poverty has a more pernicious effect, in putting all improved implements of Agriculture, beyond the reach of the generality of native farmers, and rendering impossible any attempt at experimental farming, from which, in a very short period, our native land, but particularly Scotland, has been raised from a position in practical Agriculture much lower than the Indian, to its present refined, and I had almost said, perfect state: their poverty has a still further effect by limiting the supply of water which, where plentiful, supplies the place of manure in an almost magical manner.

When the Society consider, that the Agriculture of each county in England, yields materials for one or more complete works, with numerous essays on each individual object of cultivation, they will scarcely expect from any one of their members more than a limited attempt to bring before them the agricultural practices of a single Province. Selecting perhaps one article on which to give more minute information, I shall confine myself to Benares, one of our richest districts, whose annual export, in sugar alone, exceeds half a million maunds, with a nearly equal value in opium and indigo; and considering the cultivation of sugar to be of the greatest importance, shall confine myself to its detail.

The Province, except on its western frontier, is bounded by the rivers Ganges and Dewa or Gogra, which meeting at Revelgunge near Chupra, separate it on one side from Chuppra and on the other from Arrah.

In climate, although agreeing with Bengal in its general division into cold, hot, and rainy seasons, this province, I consider, differs more from Bengal, than the most northerly and southern portions of Great Britain differ from each other.

The air of the cold season is dry, clear, and sharp, the nights frequently attended with frost, injurious to several articles of culture; the most tender of which may be stated, as Urrear, Gram, and the koonty of Indigo. I have however known

it so severe as to injure the whole rubby crop materially. This want of moisture in the atmosphere, when not relieved by rain or artificial irrigation, almost wholly checks vegetation ; it rarely however happens, but one or more showers fall during the cold weather, which commences in October, when the seed for the rubby crop* is committed to the earth, and ends in April, by which time the harvest is gathered in, and the husbandman is again busy in preparing for the ensuing year, by planting the great sugar cane crop, which it is his business to water and hoe continually throughout the hot weather, which rages from April till the rains commence, generally from the 10th to the 20th June, but occasionally not till July, when the air is of a temperature scarcely conceivable by those who have not endured it. The rains generally commence, as in Bengal, with much thunder, lightening, and wind, and continue till the end of September, with more breaks however, and of longer duration than in the Lower Provinces. The first shower sets the whole Agricultural population in motion. Land has to be prepared for Rice, Hemp, Urriar, Indigo, Peas, and all the lesser grains, which compose what is termed the Khureef crop, and as the season advances, the land for the Rubby crop and Sugar, to be sown in the following spring,is also put in course of preparation, by receiving two or more ploughings.

The soil of such an extensive Province must be very various, yet its two grand divisions may be stated as clay and sandy loam. The former generally more suited to the Cerealia and other Khureef crops, while the latter and lighter afford good Khureef. Both soils are frequently much intermixed with granulated calcareous matters, known commonly under the name of Kunkur, and containing from 3 to 30 per

* The Rubby includes all the European grains and such of the Native as are reaped between the cold and hot weathers, generally in February and March Sugar is not distinguished as either Rubby or Khureef.

cent of lime : where this Kunkur exists in excess, it injures the productive quality of the soil, often to its total destruction. Cotton, however, I have observed to thrive with a greater quantity of lime in the soil, than any other crop. Saline substances also (Salt,Soda,Saltpetre) pervade many large tracts of the Province, and where abounding, render the soil absolutely barren ; the largest tract of which I am aware, com-commences below Doony Ghaut on the Dewa, in the Collectorate of Azimghur, and runs nearly parallel to the river, throughout the North-eastern part of the district, until it enters Oude. The neighbourhood of this tract is occasionally interspersed by spots of some fertility, but the belt of Oosur (the name by which these barren spots are known) is clearly traceable from Doory by Beteria to Koilsa. The saline earth is exported in its natural state, to Goruckpore, for the manufacture of soap.

No part of the Province appears wholly free from barren spots, caused by these salts in the neighbourhood of Ghazipore, between Benares and Allahabad, and in the Jaunpore district they are to be met with, but none, that I am aware of, equal in extent to that above described.

A third but much smaller division of the soil is a black mould of no very great fertility and bringing to mind the inert vegetable soils which constitute what are called Peat Mosses or Bogs in Ireland : this soil would doubtless, on increased means, be improved by the addition of lime or other active manure, but this is a step in Agricultural advancement which time can alone effect : this soil exists chiefly in the South-eastern portion of the Province, between Ghazipore and the Dewa.

Perhaps no Province in India is so bountifully supplied with Rivers as that of Benares ; in addition to the Ganges and Dewa, which in a manner enclose it, there are the Goomty, navigable at all seasons, the Monghie, Toie, Tonse, Surjoo, &c.,

all more or less navigable during the rains, and furnishing water for irrigation, throughout the cold and hot weather. At a very trifling expence, they might be rendered of infinitely more advantage to the country, by simply having substantial bunds thrown across, after the rains, so as to raise the water to the surface, and thus also keep the general level of that of the wells higher, and consequently more attainable than at present. The Tonse, in addition to the Goomty, which is a deep and placid stream, navigable for boats of 200 maunds, in the driest weather, till it joins the shallow channel of the Surjoo river, might, by means of a canal, not exceeding a few miles in length, be joined to the Dewa, and afford immense advantage to the fertile district through which it runs, and which furnishes a large proportion of the best sugar manufactured in the Azimghur collectorship, estimated by Mr. Hamilton, at 3,00,000 maunds.

Another means of adding vastly to the produce of this Province, is the sinking of pucka wells where required; the cost is generally too much for the interest each individual possesses in the land, even were a great proportion of the landholders not already involved; yet the accompanying sketch of present produce from 30 begahs of average land without water, and what it would be by the creation of a well, will shew the Society, that it is a matter worthy their utmost attention, and even that of the Government. Thirty Beegas of land, for which there is no supply of water but the casual showers that sometimes fall, will, on an average of five years, scarcely yield six maunds of barley per beegah; whereas, a good well, will irrigate in the hot weather ten beegas of Indigo, five of Sugar, and in the cold weather, fifteen of Barley, the value of which may be taken as follows :—

	Seers.	Seers.	Rs.	Rs.
10 Bs. Indigo,	at 6 per B.	60	at 4 per seer.	240
5 Bs. Sugar,	at 6 mds. p. B.	30	at 9 per md.	270
15 Bs. Barley,	at 8 mds. p. B.	120	at 2	240

Brought over Rs.	750
Deduct value of 30 Bs. unwatered Barley, at 6 per B. and 2 Rs. per maund.	360
Total excess of produce.... Rs.	390

This of course is not all profit, a great portion in fact consists in the wages of labor applied in raising water, crushing and manufacturing Sugar and Indigo : that however it is a profitable employ, the following statement of average cost and produce of a single Beega of Indigo watered, and one sown during the rains, will show.

	Rs. As.		Rs. As	Rs. As.	Rs. As.
Irrigation & sowing,	5: 4				
Add, land rent....	0: 8				
	5: 12	Produce 6 Seers at	4 = 24	÷ 5: 12 =	18: 4
Sown in the rains....	2: 8	Ditto 3 ditto at	4 = 12	÷ 2: 8 =	9: 8
		Difference......	12		8: 12

The sinking of a single well gives profitable employment to 24 men during the hot weather, and causes 30 beegas of average land to produce the annual value of Rs. 750, instead of Rs. 480, if employed in the usual Rubby crop, which it renders certain, besides permanently improving the whole of the land. I would give the following rotation to produce as above, and have no hesitation in saying that for fair land it is below what would be the actual turn out.

7 Bs. of Indigo yield 6 sr. per B. at 4 Rs. per sr.	168
5 Bs. of sugar yield 20 mds. at 9 Rs. per md..	180
8 Bs. of Barley at 8 mds. per B. 64, at 2 Rs. per md.	128
	476
20 Bs. of Barley without water, at 6 mds. per B. 120 mds. at 12 Rs. per m..................	240
Difference..	236

Sugar requires more water than Indigo, and much more labor.

"*Remarks on the Variety of Cane termed Otaheite but which is supposed to be identical with the Yellow Batavia Cane.*" *By* J. V. THOMSON, ESQ. M. D., *Depy. Insr. Genl. of Hospitals.*

Having taken some pains to investigate, and s et my own doubts to rest on the subject of the *Otaheite Sugar Cane*, said to have been introduced into the West Indies, the Mauritius and India, I think the data upon which I have come to the conclusion that the *Cane*, erroneously so named, is the *Yellow Batavia Cane*, may prove useful and interesting to the Society; and I have no doubt, but on an attentive review of facts, they will arrive at the same conclusion, and that the real Otaheite Cane has been only introduced into Bengal during the last year, direct from that Island, being sent by Mr. Pritchard, the Consul there, in a closed case, via Sydney, by the Favorite Sloop of War, and thence shipped off for Calcutta. As these canes are now probably in a fit state for comparison in the Society's Nursery, it would be desirable that some member, or members conversant with the sugar cane, should institute such an investigation as may prove satisfactory.

It is somewhat singular that Mr. Crawford, who is good authority on most subjects connected with the Indian Archipelago, should have supposed the fine cane principally cultivated for sugar in Java to be an exotic and to have been introduced by the Dutch, from the West Indies (!) in very late times.

Three others he considers as indigenous, viz. 1st, A pale yellow cane, having joints 5 inches long; 2nd, a greenish yellow cane, not above an inch thick; 3rd, a brown or purple cane, often 2 inches in diameter. Vol. i. p. 473.

I shall now show that this fine cane could not be a late introduction, as in Cook's very first voyage it is noted, " sugar is also produced here (Batavia) in immense quantities, very

great crops of the *finest and largest canes that can be imagined*, are produced with very little care, and yield a much larger proportion of sugar than the canes in the *West Indies*." *Loc. cit.*

The following quotation from Mons. Cossigny's moyens d'amelioration des Colonies, is also confirmatory of this fine cane being as much indigenous in Java as the others, and no late acquisition, and it further shows when this cane was first introduced into the Mauritius, and thence into the West Indies.

Alluding to a Memoir on the Sugar Cane by Mons. Moreau-de Saint Mery, he states as follows—" The Author says, by mistake, that it was the Government, which sent the Batavian canes to America. I claim that honor: I was the only Planter of the two Islands, (Mauritius and Bourbon) who possessed those two species of cane, which I procured from Java in 1782, and which I have multiplied on my plantations, up to the period of my departure for France in 1789, the period when I distributed the canes over the Island, and when I sent them to the Island of Bourbon (Isle de la Reunion). I had previously transmitted a supply of these canes to the American Colonies, by two Government vessels, the Alexander, commanded by Mottais in 1778 and the Stanislaus commanded by Fournier, the beginning of 1789"—vol. I. p. 142.

To remove any doubt as to the identity of the cane in question, he states in vol. III. page 159, " there are two sorts of canes at Batavia, one red, the other called *white* or green, have *the stems yellowish when ripe*."

He further states, that he sent from the Mauritius, successfully to Paris, in a close case, after a method of his own, the *Canes blanches de Batavia* in 1801, which, he says, is the most productive of all those known in our eastern colonies, adapts itself to every kind of soil, is of rapid growth, and gives a finer looking sugar and in greater abundance than the others," p. 163 vol. III.

This I consider sets the question at rest of the Cane culti-

vated at *the Mauritius* being the large yellow Batavia. When there, between the years 1813 and 17, I saw no other, resembling perfectly the same cane I had previously seen so extensively cultivated in the West Indies between 1800 and 1810, particularly in St. Vincents, Grenada, Trinidad and Demerara. I am aware that many intelligent persons in those colonies consider it the Otaheite cane, but when the following account of its supposed introduction, in opposition to the foregoing facts, is duly considered, no doubt can remain of its being a mistake. I now quote from Humbolt's Personal Narrative, Vol. 10 p. 84, who also appears to labour under this error.

"In this Plantation, as in all those of the Province of Venezuela, three species of Sugar Cane can be distinguished even at a distance, by the colour of their leaves; the ancient Creole Cane, the Otaheite Cane, and the Batavia Cane; the first has the leaf of a deeper green, the stem less thick, and the joints nearer together. This Sugar Cane was first introduced from India into Sicily, the Canary Islands, and the West Indies.

The Second is of a lighter green, and its stem is higher, thicker and more succulent. The whole plant displays a more luxuriant vegetation. We owe this plant to the voyages of Bougainville, Cook and Bligh. Bougainville carried it to the Isle of France, whence it passed to Cayenne, Martinique, and since 1792, to the rest of the West India Islands. The Otaheite Sugar Cane was carried from the Island of Trinidad to Caraccas. From Caraccas it passed to Cucuta and St. Gil in the kingdom of Grenada."

"The third species, the Violet Sugar Cane, is called Cana de Batavia. Its foliage is purple and very broad; it is preferred in the province of Caraccas, for Rum."

1st. It may be observed that he here states, that the Otaheite Cane, was introduced into the Mauritius by Bougainville.

2. That it was sent from the Mauritius to the West Indies.

3. That it was introduced into Columbia from Trinidad. All of which statements are at variance with the previously recited facts—the first being quite incorrect, and the others evidently referring to the *Yellow Batavia Sugar Cane.*

As it is possible that the Otaheite cane might have been introduced into the Mauritius since I left in 1816, I have searched the Transactions of the Society of Agriculture of the Mauritius for some years back, and the sketch of the life of Charles Telfair, Esq. the Colonial Secretary, but can find no proof of any thing of the kind, although several of the most important plants introduced up to 1833, the period of Mr. Telfair's death, are named; nor do I think it likely that any persons would interest themselves in procuring the Otaheite Cane, as they already possessed, in abundance, canes of sterling value, and adapted to their soil and climate.

The cane, therefore, supplied to Capt. Sleeman in 1827, at the Mauritius, by Capt. Dick, the then Secretary to Government, could be no other than the *Yellow Batavia Cane*—See Vol. III. Agri. and Hort. Trans. p. 74.—It appears by Capt. Sleeman's letter, that these canes were planted in the Botanic Garden at Calcutta, in March 1827, and first sent to Jubbulpore in 1828, and thence distributed to various provinces.

As I had the honor, when Government Agent at Madagascar, of introducing into the Mauritius in 1816, *eleven* out of *seventeen* fine canes indigenous to that Island, I thought one of the canes introduced into India might be one of those, but as it is described by Capt. Sleeman to be of a *beautiful straw colour*, and coupling this with its size, it does not appear to correspond with any of the Madagascar *yellow* varieties. At a future opportunity I shall give the Society an account of these fine canes.

The cane subsequently introduced into the Bombay Pre-

sidency, previous to 1834, by Framjee Cowasjee, Esq. and called Mauritius or Otaheite Cane by Mr. Vaupell,—(Horticultural and Agricultural Transactions, Vol. III p. 55,)—and described by Mr. Williamson as three times the size of the common cane, is doubtless the same cane as that introduced by Capt. Sleeman into the Western Provinces, viz. the Yellow Batavia Cane.

It becomes a question, whether the real Otaheite Cane is not identical with the large Yellow Batavia Cane.

This is a point now easy to decide as the Society have the two plants side by side.

It would further be worth while to ascertain, whether the fine canes sent to the Society by Mr. Logan from Penang, under the name of Tuhobitong, together with the equally fine cane received from Singapore under the appellation of Tuboo Seeat, are not identical with the one or other of the canes, termed Batavia or Otaheite.

I shall probably forward the Society another paper on the Sugar Cane at an early opportunity, having a personal knowledge of at least a couple of dozen of fine canes, and knowing half as many more distinct varieties. This, I beg to assure the Society, is no idle speculation, but one which involves matters of the first importance to cultivators of this precious plant, as different varieties appear best suited to particular soils, sites, and climates, and to furnish more or less saccharine matter of a variable quality.

Mons. Cossigny justly says, tom. III. p. 366—

Lorsqu'on connoitra par l'experience les qualités, et les produits, des diverses espéces de Cannes qui existent sur la globe, on déterminera avec certitude le choix de celles qui meritent la préférence."

P. S.—I have two stools, with 5 shoots each, of 9 months growth, of a cane from the Eastern Islands supposed to be the Otaheite, but as the Revd. Mr. Williams, who was bring-

ing this present to me, with other plants, was murdered by the natives at the New Hebrides, on his way from the Society Islands, it cannot now be ascertained from which Island he brought it.

On the Culture of the Mango in Mysore. By — INGLEDEW, ESQ.

The seedling mango tree will produce fruit in the fourth year of its age, and afterwards usually yields one crop annually.

The produce of the seedling mango is very uncertain; and less to be depended on, than that of most other seedlings, in the quality of its fruit, and it is probable that not one in several thousands of these trees, will bear good fruit in ordinary situations.

The only certain mode of obtaining good mangoes is by means either of grafts upon known and superior trees, or else by the removal of branches from such trees, by means of barking, and the subsequent application of earth, which operation requires only three or four months; the former method, however, should always be chosen, as the grafted tree upon a suitable stock will acquire a good size, whereas the branch that has been taken away by the latter process, will always remain small, and be liable to be deficient in its supplies of new bearing shoots.

The method of grafting in this part of India, followed by the native gardeners, is that of approach, and it will always succeed very well. I have heard that mango grafts have been successfully separated three weeks after their application where the stock and branch were both fresh and succulent, but I prefer allowing them to remain three months before the branches are entirely divided from their parent trees, as their future sucess is much more certain, than if removed earlier.

Mango stones for stocks, should be put fresh into the ground, and if kept longer than twenty five or thirty days they will not germinate; they thrive best in a light and moist soil, and the young trees will be fit to be employed as stocks, frequently as early as eleven months after having appeared above ground: they ought to be grown as rapidly as possible, to preserve the wood very porous, and spongy, by liberal supplies of water, and by keeping the earth loose about their roots, and lateral branches should not be permitted to remain upon them.

Mango trees should be grown together, in a separate plantation; the situation ought to be sheltered from the high winds which, in Mysore, are very destructive to the fruit, and the trees should be planted seven yards from each other, that when full grown the branches may not came in contact with those of the neighbouring trees; they are partial to a light and moist soil, and whilst young should be kept in an upright position, and the tops fixed and steady to avert their being shaken by the wind, which might injure the united incisions, by means of bamboos, which ought to be inserted in the ground at some distance from the roots to prevent the white ants from attacking them.

The grafted plants may safely be deprived of their original and unnecessary wood, with the exception of one branch, which is to be retained to form the top, as soon as they shall have obtained new and strong shoots after being placed within the ground; but this must be accomplished by slow degrees and by taking away one or two branches only every fortnight; they should afterwards be examined every year until they bear fruit, and all superfluous shoots removed, which will increase their growth. They ought to be carefully preserved to one stem, which must be free of branches, to the height of four feet from the ground.

Mango grafts may be applied at any time of the year in the Mysore country, and provided the earth about the roots of the

stocks be preserved constantly moist by the daily application of water, with almost certain success. When the union of the stock and the graft is complete, the latter may be separated by degrees, at two or three separate cuttings, the trees ought afterwards to be preserved under the shade of a neighbouring tree for a fortnight or three weeks more, that the united parts may acquire firmness and strength, when they may be transported without injury.

I have repeatedly separated the graft with success after it has been only two months attached, but I prefer allowing it to remain undisturbed another month, for the reason above stated.

The roots of mango trees penetrate to a great depth within the ground, and it is consequently difficult, and very unsafe, to transplant them after they have acquired any size.

The grafted mango tree will frequently bear one or two mangoes very soon, or perhaps immediately after having been separated from the parent tree, and it then ceases to yield fruit for several years. A few blossoms, will probably appear in the second year afterwards, in a large plantation of these trees, and during the third year about one tree in fifty will yield fruit, but the grafted mango tree does not bear fruit generally until the fourth year after its separation, and frequently not so early; when it has once acquired the habit of furnishing fruit, its supplies are afterwards regular, and similar to other trees of the same species.

The fruit which this tree bears, soon after being grafted, is produced and nourished from the grafted part, or the top principally, as a continuation of that influence it had received from the parent tree, and before it has become perfectly assimilated with the juices and the fibres of stock; for were it derived from the combined influence of both the stock, and the graft, acting together, there could be no reason why it should not persevere in bearing fruit every year afterwards; it

therefore would appear to require a few more years to combine itself with the stock into one assimilated substance, the same in quality and constitution, to qualify it for reproduction, after which the nutrition of the fruit is solely supplied from the lower part of the tree.

The grafted mango tree may always be relied upon, as it will invariably yield the same fruit as the parent tree from which the graft may have been taken, and this fruit tree should always be cultivated in this manner. The grafted tree will never attain the size of a seedling, but, as has been already stated, it grows considerably larger than the branch removed by barking; this however is the only advantage, for the latter is equally certain of producing good fruit.

In the Mysore country six different species only, of superior mangoes, have hitherto been introduced, viz: The Raspberry, the Alfonso, the red or Calicut Mango, the Goa common, or, as it is called at Madras, the St. Thomè Mango, the Mazzagon and the Hooliardroog Mango. I have placed their names in this list according to their estimated qualities at Mysore, the Raspberry being unequivocally the finest, and superior to all the others.

This list contains the names of all the esteemed mangoes which have come to my knowledge, with the exception of the Fernandeen, which is I believe nearly peculiar to Goa, and is by no means common even at that place. I have been informed by an Officer long resident at Goa, and who was acquainted with the Portuguese there, that the Alfonso mango has long been considered the first in quality by the inhabitants of the settlement, of the different sorts which that place affords.

It is probable that the finest mangoes which have been produced in the Deccan are indigenous to Goa, where they have been reared from seed; the Raspberry, the Alfonso, the Fernandeen, the red or Calicut mango, and the Goa common

or St. Thomè mango, were certainly originally furnished from that establishment, where I have several times been informed, the seedling mango attains a greater perfection than in any other situation in the peninsula of India, and I understand that all the superior kinds of mangoes at Bombay, with the exception of the Mazagon, were introduced there from Goa by the late Mr. Desouza. All the trees of the species here called the red mango, from its high external and internal colour, have been obtained from a solitary tree at Calicut, which goes by the name of the Goa tree, and is said to have been imported from that place.

The Mazagon mango is probably indigenous to Bombay, where a single seedling, and at this time a very old tree, at Mazagon upon that Island, has been well known for many years, and from which all our trees of that name have been taken.

The only knowledge we have of the Hooliardroog mango, has been derived from a seedling tree at Hooliardroog in Mysore, but how it originated, or whence it came, no person of the present day is acquainted.

The Goa, common mango of this list is, as has been already stated, the St. Thomè mango of Madras : as it has been known at that Presidency only of late years, and as the inhabitants of Goa have been acquainted with it from time immemorial, I conceive it to have been imported there from the latter place.

I have not been able to ascertain the Portuguese or proper name of this mango.

In the soil and climate of Mysore, the Mazagon and the Hooliardroog mangoes are so greatly inferior to the other species above mentioned, as to be almost unworthy of cultivation; the former has here a disagreeable waxy taste, and the latter is too acid to be pleasant when placed in competition, with any of the other kinds at Bombay. I know that the Mazagon mango is generally preferred to any other, and this great difference in quality, is probably more to be imputed

to the nature of the climate, than to that of the soil in these two places.

There can be no doubt, but that the different species of mangoes above enumerated, differ very materially in quality, according to the soil and climate in which the trees may be cultivated. The St. Thomè mango is little esteemed at Goa, and still less at Bombay, whereas both at Madras, and at Mysore, it is considered a very superior fruit, compared with some of the other kinds: at Goa they prefer the Alfonso, and at Bombay the Mazagon is generally held in the highest estimation.

The Alfonso mango is said to have obtained its name from the great Albuquerque, the second Viceroy of Goa, upwards of three hundred years ago; he was named Alfonso, and died in the year 1515.

I have frequently endeavoured to innoculate the Mango bud upon another tree of the same fruit, but hitherto without success. Could this operation be performed successfully, it would be of great advantage to the Horticulturist.

The mango tree always bears fruit upon the extremities of the branches, and our grafted trees very frequently yield two crops of mangoes annually, one in the middle, and the other in the latter end of the year; the former is, however, the principal crop, and is far more abundant than the latter; being the natural crop, it is much more certain than the other, and the season is more favorable and suitable for bringing the fruit to perfection; the second, or December crop, is always trifling, and the fruit very inferior to that which the trees furnish in June: it is not unusual for some of these trees to continue to yield a few mangoes from Christmas until the latter end of May, when the crop is matured and ready to be plucked.

The fruit which the mango trees are liable to bear in December and the beginning of the following year, is in some degree not desirable, as it is apt to weaken the trees, and to

diminish the great crop in the middle of the year, whenever it may be at all considerable.

It is usual for the same branch to yield mangoes once only, and then to enlarge, but it will throw out four or five buds all round, and close to its extremity, and I have known two of these separate shoots to blossom, and bear fruit one in the beginning, and the other in the middle of the same year, upon the end of the same branch.

Whilst the fruit is setting, the mango tree is every where giving out new shoots, either by the older branches becoming lengthened, or else the end of these become surrounded by circles of new wood, which shoots, in their turn, enlarge in a similar manner; it is this effort which fixes the fruit, and where it may be very feeble the blossoms will fall to the ground and furnish no fruit.

The branches which have been produced by the rains of the South-west Monsoon, will blossom in January and February, and sometimes as early as December, and yield ripe fruit some time in the month of May; this crop is finished on some of the trees in the middle of June, and on the others early in July, at which time they have all acquired a large additional supply of new wood, for they commence to throw out new shoots immediately after the blossoms are fully formed; some of these branches will blossom in July and August, and yield ripe fruit in December and subsequently, but owing to the weakness of these shoots, the blossoms more usually fall to the ground, and but very little fruit is formed, and this does not take place upon all the trees, for many will be barren this crop.

The Goa common, or St. Thomè mango tree, is more prolific in fruit throughout the year than any of the superior sorts, its shoots are slender, and much less vigorous than those of the latter, and are on that account more speedily reduced to that condition, which enables them to blossom, whereas the

new shoots of the finer tree are thicker and stronger, and require a longer time to give out their blossoms.

The branches of these trees are capable of bearing blossoms from the time they have attained the age of a few days only, to that of one year; but wood that is upwards of twelve months old, will not, I believe, yield fruit itself, and must supply fresh shoots for that purpose: the blossoms of the very young branches drop to the ground, and those that are six months old, or upwards, appear to be the most certain of retaining their flowers, until the fruit be formed from them.

The mango tree, if very vigorous, will for some time persevere in giving out repeated and constant successions of new shoots from very young branches, which lengthen and give out others in their turn, whilst their wood is very immature: trees in such condition can never yield fruit, as the interval or state of quiet, through which the tree passes, between the cessation of the exertion of furnishing one set of branches, and the commencement of another, is insufficient, in point of time, to admit of their blossoming.

The fruit of the mango tree never acquires perfection at Mysore without frequent showers of rain, and this singular benefit appears to be derived from the application of the moisture to the surface of the fruit itself, and not by wetting and cooling the ground merely at the roots of the tree, for any abundant supply of water to the latter by artificial means, to preserve the soil as moist as may be desired, has not the effect of perfecting the quality of the fruit, as I have several times witnessed, in the dry months at this season of the year. The Goa or St. Thomè mango, although full grown, and ripened as completely as it is capable of being, whilst upon the tree, remains of a pale green or whitish colour externally, having a tough and a thick skin, and the meat it contains is dry, and acid, of a light white color.

and is ill flavored; whilst the Alfonso mango has likewise a dry and thick skin, the meat is soft and acid, or else black and decayed near the seed; the former is never rich and juicy and high coloured, nor is the latter sound and perfect within, and their exterior surfaces never acquire that high and golden colour, which is natural to them in a state of health.

This peculiarity was very striking at Mysore in the year 1814, when the South-west monsoon rains were much later than usual in their arrival, the Alfonso and the Goa common Mangoes were then in the condition above described, and remained so, for some time after they had attained their full growth: an obvious and speedy improvement was very observable in the quality of the fruit after the appearance of the showers, the colour of the skin then altered, and instead of remaining hard and dry and of a dull colour, it became thin and soft from being filled with juice, and of a bright and rich colour, the interior pulp of both kinds, but particularly the latter, was of a higher and deeper colour, and exquisitely rich in flavour; the Alfonso mango was sound and firm throughout, and almost entirely lost that decay near the seed, which had been common to the earlier fruit.

In this year the North-east rains continued at intervals throughout the months of November and December, and we had several showers in the beginning of January 1815: we had a few ripe mangoes in the middle of December, and for some time afterwards, that were very well flavoured, and superior to any that I remember to have seen at the same season of the year when we were without rain.

I am informed that at Bombay, and at Goa, the rains injure the flavour of the mangoes considerably, and that they are never so good afterwards, as previously during the hot and dry weather. I have also been told, by a gentleman who had long resided at Bombay, and who was partial and attentive to the culture of these trees, that whenever the

monsoon was late in making its appearance, they yielded the finest and best fruit.

This apparent irregularity may perhaps be accounted for with but little difficulty, for it may easily be credited, that the heavy rains common to Bombay and Goa, at this season of the year, may injure this fruit, whilst the showers we have in Mysore may not only be incapable of doing it any mischief, but may occasion the improvement just now mentioned.

Should our future experience assure us, that moisture to the surface of the Mango is requisite as it is approaching maturity, and that it is incapable of arriving at its utmost perfection without it, in some situations, this fruit might perhaps be improved by frequently scattering water upon its surface artificially.

The mango, like most other fruit which I am acquainted with, is better for having the tree pruned; all weak and crowded shoots should be removed, branches should never be permitted to hang upon the ground, and the interior of the tree should be prevented from becoming crowded with wood, as these shoots are incapable of furnishing fruit if in close contact with one another : whenever the interior of the tree may contain superfluous branches, or where there is not room sufficient for the extension of the young and fruit bearing shoots, an open and vacant space ought to be provided for the new shoots by the removal of all the old and unsuitable wood : it is the omission of this practice which occasions mango trees to bear fruit usually on their exterior branches only, and in smaller quantity than they are capable of, if properly managed : no diseased wood ought to remain, and the branches should be preserved separate and distinct throughout every part of the tree.

At the conclusion of the crop of fruit the trees have acquired their supply of shoots for that season, and they continue at rest during the ensuing five or six weeks, and some times

longer, and during this interval the operation of pruning ought to be performed : the latter half of July is generally the most eligible period for this purpose, and as these trees bear irregularly, and some of them will be much earlier in ripening their fruit than others, these should be first pruned, that any interference with the approaching production of blossoms, which may possibly otherwise occur, may be avoided.

The quality of the mango may be improved, and the growth of the tree facilitated, by digging the ground once every year to a considerable distance all round its roots to loosen the soil; also by removing the gross roots from amongst them, and by the addition of a suitable supply of manure according to the size of the tree : the most favourable period for this process is in the latter end of November, or early in December, a short while previously to the appearance of the large crop of blossoms.

Foggy and cloudy weather is injurious to the blossoms of most fruit trees, but it is particularly destructive to those of the mango. A dry atmosphere, with a powerful sun, have an opposite effect, and conduce particularly to the health and success of all fruit blossoms : the former convey nourishment to trees, the latter deprive them of part of their nutrition, shewing that the two processes of blossoming, and the formation of new wood, are produced by two opposite causes. A strong and vigorous shoot will be much longer than a small and delicate one, before it comes into blossom, but the blossom of the former will be more certain of furnishing fruit than that of the latter, and its fruit will both be of larger size and superior quality; it ought therefore to be a particular object of the Horticulturist, to remove all delicate branches, and preserve such only as are strong and vigorous upon this, and all fruit bearing trees.

I was lately furnished with the following list of all the good sorts of mangoes cultivated at Goa, by a Portuguese gentleman, who had long resided at that settlement; but with the excep-

tion of the two first, their names are unknown to me, nor do I know whether the several kinds we cultivate in Mysore, be included in this list. Their names are as follows, and they are inserted in succesion according to their usual esteemed qualities at Goa—1st. Alfonsos; 2nd. Fernandinegras; 3rd. Callaca; 4th. Barratas; 5th. Salgaras; 6th. Massaretas; 7th. Bispo; 8th. Cameras; 9th. Thimotas. Some future opportunity may perhaps offer of applying some of these names, besides the first and second, which are already familiar here, to our different varieties of the mango tree.

Sequel to the Correspondence regarding the Manufacture of Nipal Paper at Darjeeling. Result of MR. MARSHMAN'S *Experiments.*

I am sorry, to say that the experiment we have made with the bark holds out little hope of success. I fear it will not be found an eligible material, while other materials which can be wrought up with less trouble and expense, are to be had. I send you a specimen of the paper we have made. It is scarcely whiter than that which you have succeeded in making, though we steeped a hundred weight of it for eight hours in twelve pounds of Chloride of Lime. The same quantity of *sun* and cotton rags requires only a dose of five or six pounds. The bark of which this paper is made has had every advantage that English paper receives, it has been steeped, and boiled, and sized; yet it makes but a very inferior article, adapted only for Bank note paper, in which color is nothing, and strength, every thing. Neither could we make it of a thicker texture. There appears to be so much of the mucilaginous substance in it that it will not run freely on the web, if any attempt is made to give it greater thickness. I have many doubts about its being brought into general use, with the machinery which is now in vogue. The *sun,* which can

be had here for 3 Rs. a maund, with a mixture of rags, makes a far superior paper than the bark has yet yielded, and I fear, that the expense of bringing it down to the manufactory, combined with charge incurred in doctoring and bleaching it, will prevent its application to the preparation of paper.*

* The Committee of Papers, are indebted to the kindness of Mr. Marshman for the above interesting appendix to the correspondence published in the 3rd No. of the Journal. The chief use to which Nipal Paper appears to have been turned, is for the purpose of filtering in performing certain chemical experiments, in which it was supposed to possess very superior advantages, from its great strength and tenacity; allowing of a prepicitate being subjected to considerable pressure by twisting the filter without tearing it. We are much inclined however, after having used it extensively, to doubt its fancied superiority over the common English bibulous or filtering paper from the much greater length of time which is required to obtain the filtered liquor, and the turbidity of the solution which results, and which is very rarely so bright, clear, and free from impurities, as when good European paper is used for the purpose. Its great strength, and lightness, appear to recommend it strongly for all the purposes of packing, where the dinginess of its color is a matter of no consequence, and altogether subordinate to its other qualities. For this purpose, if rendered water proof, we should consider it much superior to the wax cloth in common use, for transmitting Banghy and Dak parcels during the rainy season, from its smaller weight (stated in Mr. Maddock's letter to be but one-third of the same size of wax cloth) and greater protection against moisture.—ED.

Further particulars regarding the Chundaree Cotton. By Major W. H. Sleeman, Agent to the Governor General in Bundelkund.

(Presented to the Society.)

Bareilly, 22d March, 1842.

Enclosed I send a memorandum just received from a native friend of mine, who has been through the district of Chundaree where the fine cloth called Mahmoodee is manufactured in the Gwalior territory. I have sent to ask him 1st. What is the size of the Beega he mentions ? 2nd. Why they do not sow more of this cotton in the district of Chundaree, but depend upon Indore for their supply ? 3rd. Why he describes the cotton as of a yellow colour when the skein he has sent me as a specimen seems white or nearly white ? 4th. Whether the leaves of the shrub are a reddish brown, or only the bark of the stalk and stems ? As soon as I get his reply you shall have it ; and in the mean time I shall be glad to ask him any more questions that you wish. The skein of cotton he has sent me I send you. It seems of a very superior quality ; but I am no judge.

MEMORANDUM.

The Barareea cotton comes from Indore to Chundaree. It is of a yellowish colour ; and grows only in the villages in the Chundelee District, Hirawul aud Sookdaroo. In these two villages there are five or six fields in which this kind of cotton is cultivated. The shrub is from two to two and half cubits high, and the thickness of a man's finger ; and of a reddish brown colour. When rain falls in due season one Beegah yields four or five maunds of Kupas, or cotton in the seed ; and one maund of Kupas yields six seers of cotton : there are four seers of wastage, and thirty of seed. It is sown annually, and takes the same time to ripen as other cotton.

The cotton comes from Indore to Cunderee with the seed in it; and is there separated from the seed. After this it is dressed with a small bamboo bow instead of the large clumsy one in common use, and woven into thread. Three ounces of cotton yield only half an ounce of thread. The rest is wasted. One skein of this contains nine hundred and sixty cubits of thread, and weighs something less than two and a half massah. Five of these skeins are sold for a Rupee; and one hundred skeins go to a piece of cloth twelve yards long by three quarters of a yard wide. If woven into a turban or into a piece of what is called Mahmoodee, it sells for fifty Rupees, without gold or silver embroidery; and if woven into what is called Meetha it sells at about forty Rupees the piece. The hundred skeins of thread, which are required for the piece, cost twenty Rupees; and the rest goes to the labourer.

NOTES REGARDING THE BARAREEA COTTON FROM JEWUNRAM.

The leaves and stems of the Barareea cotton plant are of the same colour as those of the other cotton plants; but the cotton itself has a yellowish tint. In the villages of Herrawul and Singwara alias Sookdaroo, in the district of Chundaree, there are five or six fields which produce this kind of cotton. If the seed of the Barareea cotton be sown in any other fields in that district, the cotton produced is found to be like the produce of any other seed, and to lose all the peculiar qualities of the Barareea cotton.

In the pucka Beegah, which is measured with a full Jureeb of one hundred cubits, four or five maunds of this cotton are produced in favorable seasons.

Interesting Particulars on the growth of the Chundaree and Nurma Cotton, and the intricacies of its manufacture. By C. Fraser, Esq., *late Agent to the Governor General in Bundelkund.*

(Presented to the Society.)

I am sorry I cannot meet your wishes in regard to furnishing you with the *fine Chundaree Cotton,* as there is *no* such article, the Chundaree district grows very little Cotton, and that of the common quality of Bundlekund. The fine fabrics of Chundaree are made from the Berar Cotton, which is imported from Indore. The Berar or Amraotee Cotton, is longer, finer, and softer than the Bundlekund, but this I am told is owing to some peculiarity of soil and atmosphere; it is not, I believe, a peculiar class of plant; the produce sells for double the price of Bundlekund. In Malwa generally, the Cotton is the same as in Bundlekund, but is grown in a different soil. In Bundlekund the richest soils are selected; but in Malwa, what we in Bundlekund call Kankar, a coarse gravelly soil. Malwa is however a damp moist climate, and the soil well supplied with water, which may render the inferior soil more fruitful there, than we find it in Bundlekund. Of the Berar Cotton there is only a small consumption in Chundaree, seldom exceeding about 2,000 rupees worth per annum. The great supply of cloth being a coarse Mahmoodie, which is manufactured from the common Bundlekund Cotton. The great superiority of the fine Chundaree cloths is attributable to the care taken in the manufacture, and the skilfulness of the weavers in the manipulation, the weavers are all Mahomedans, and are distinct from the other inhabitants of Chundaree. No women are employed even in making the thread, the weavers work below the surface of the ground in a sort of Tye Khanuh, a room under ground almost impervious to the natural air, and cautiously kept damp to prevent the dust which may, after every precaution enter, from fly-

ing about. The room is so dark that on first entering, its objects are scarcely distinguishable; the greatest care is devoted to the preparation of the thread, which, when of very fine quality, sells for its weight in silver. The weavers are constantly employed and unable to execute the commissions they receive; they never work for the general market, but the Courts of Gwalior, Indore, Kota and the neighbouring Bundlekund chiefs have koties or houses of business on the spot, to make advances to the weavers, and through these the coarse qualities get into the market, whilst the superior fabrics are monopolized by the chiefs. Every bale of cloth is marked with the Gwalior stamp, there being a regular custom establishment kept up by the Gwalior Government for this special duty. The *Nurma,* or as it is ordinarily styled the *Nurmabun,* is found all over Hindoostan; it is never employed in the Chundaree or any other manufacture, nor is it grown in large quantities: the plant stands about seven feet high, and is bushy; solitary plants are met with occasionally in private gardens, and the produce is worked up into brahminical threads for the higher classes of society. If you wish it, I can procure you some of the seed; the plants last for five or six years. This Cotton is not cultivated generally on account of its being necessarily irrigated, or it will not thrive; this adds of course greatly to the expence of cultivation.

In working the Chundaree cloths, one of the objects of keeping the room damp is that the thread used, being very fine, would be liable to snap if allowed to get dry. Captain Doolan tells me, that the description of Chundaree manufacture would exactly answer for the system adopted at Lyons, in respect to the fine fabrics produced there.

On the cultivation of Tobacco at Bhilsa, with a specimen of the soil. By Dr. R. H. Irvine, Residency Surgeon, Gwalior.

(Presented to the Society.)

The soil in question was taken from the centre of the field in which the Tobacco is grown. The field has been celebrated for above one hundred years for producing this superior Tobacco, and is situated eastward of, and adjoining to, the wall of the town of Bhilsa, and is completely enclosed by a wall of stones, containing an extent of six or seven begahs, (say about three acres.)

In this space, Tobacco is alone cultivated and no other crop. The ground is copiously manured, nearly the whole of the town manure being ploughed into the ground previous to planting out the Tobacco plants. The manure is a compost of cow-dung, horse, and sheep dung, straw, fire ashes, and general refuse, amongst which must not be overlooked the baked clay of broken earthen pots.

This field alone produces the superior Tobacco, though that plant is extensively cultivated of the ordinary quality round the town.

The fine produce of this field is not to be bought.

The soil of this field is not alluvial; being far removed from any nullah or river.

Besides the immense quantity of manure supplied, the plants are carefully weeded, and thinned out, the strongest only left; the flower buds are nipped off, saving the few allowed to remain for seed; and five or six leaves are the utmost extent allowed to remain on the plants.

The seed is never changed.

The soil appears to consist of debris of various kinds, and stiff loam, in nearly equal proportions.

The debris is chiefly the remains of substances in the manure; small pieces of red and black earthenware and carbon; also of small pieces of kunkur (calco-silicious con-

crete effervescing slightly with acids) and pieces of compact felspar and black schorl.

The other half or elutriated portion, is a stiff dark coloured loam, containing in the hundred,

Alumina,	65.0
Silica,	34.0
Oxide of iron,	0.30
Carbonate of Potash,	0.30
Loss,	0.40
	100.00

The presence of the carbonate of potash, is doubtless owing to the large quantity of wood ashes contained in the manure applied.

The chief, if not the only cause, of the goodness of the Tobacco of this single field is the very careful and high cultivation applied.

Memorandum accompanying a Net exhibited to the Society, and manufactured from the stalk of the Common Stinging Nettle of England. By Capt. A. C. RAINEY, *Assist. Political Agent, Subathoo.*

1st.—The Nettles, from which this sample was wove, grew in the low valleys adjacent to the Hill Station of Simla in the Himalaya mountains.

2nd.—The vegetable abounds in all the ravines and valleys of those mountains, and forms one of the most rank weeds of the places, during the rainy months.

3rd.—In August and September, when it is in perfection, can be obtained in any quantity running from 5 to 6 and 7 feet in height.

4th.—As far as I have been able to ascertain, it is chiefly in demand—if not at present wholly so,—for fishing nets;

in consequence of the virtue ascribed to the cord wove from it, of gaining increased strength by constant immersion in water, and resisting decay from that element longer than any other description of cords.

5th.—The weed is known throughout the lower and centre ranges of the Himalaya by the names

Bábâr,	or Allow,	or Bichoo
बबार	अलाओ,	बिछू

the last evidently consequent on its stinging property;—being the common designation of the Scorpion.

6th.—The following is the preparation to which the article is subjected by the Natives of the place; but I doubt not much of the process might be omitted or simplified.

1st. Being cut in August or September, the weed is exposed for one night in the open air.

2nd. The stalk is then stripped of leaves and dried in the sun.

3rd. When well dried it is deposited in an earthen pot which contains water mixed with ashes: (the refuse remains of any wood fire) and boiled for four and twenty hours.

4th. The stalk thus boiled is then taken to a stream and well washed.

5th. The Hemp is then brought home, and being sprinkled with flour, (otta) (of the grain called koda), it is again dried in the sun and afterwards spun at any time into cord for nets of every description.

I am induced to bring the article to the notice of the Agricultural Society, in the hope that the present increasing demand for Hemps of every description, may serve to attract all due attention to an article, which, from its declared resistance to decay from immersion in water, seems to render it worthy of a more prominent place in the mercantile world and of great public utility.

The commodity came under my notice only late last year, and I deferred to bring it to notice till I had an opportunity of making experiments as to its strength, &c. &c., and until I could collect a large quantity of the Hemp which parties had engaged to do for me in the ensuing rains. But my unexpected temporary absence from my station has placed this beyond my power, and I think it better to put the Society in possession of the little I know regarding it, than wait the period of my return.

On the mode of successfully transmitting Plants from one Country to the other—Coffee Culture in India—Remarks on experiments in Horticulture and Floriculture. By Major H. C. M. Cox.

Having observed in the Proceedings of the Society some remarks relative to the transmission of Fruit seeds, in reference to the plants, I beg to communicate, for the information of the Society, an experiment tried at the Cape of Good Hope while I was there in 1839, and which was attended with the most perfect success.

Baron Von Ludwig had a box containing 1200 young plants despatched to him from Germany, they were five months in the box, and Mr. Bowie, in charge of the Baron's garden, informed me that out of the 1200 not above two dozen had failed to vegetate when put in the ground.*

The plan adopted for the transmission of these plants was so extremely simple, that I was induced to notice it especially with a view to its adoption in India, particularly as the seasons and usual length of voyage from England to India are favorable. The plants are taken out of the ground in the depth of winter, when the *stems* are bare of leaves and all the *sap* has descended to the roots. The earth is carefully shaken from the roots, which are then immersed in a thin compost

four or five times till they are completely coated over to the thickness of ⅛ to 1-10th of an inch, allowed to dry perfectly, when they are placed in a strong box prepared for the purpose, on a layer of dry straw. As soon as one layer of plants is completed, a layer of dry straw is placed over it, and so on till the box is completely filled and well pressed down; the lid is put on, the seams well *pitched*, and the case made as air-tight as possible. A box of young fruit trees so prepared in the end of January, would arrive here just in proper time for being placed in the ground at the commencement of the rains. The soil of the Botanical Garden, and indeed Bengal, is ill adapted for experimenting on extra-tropical plants and trees. The thick substratum of clay usual in Bengal precludes the dispersion of moisture from the roots of trees and rots them. Darjeling offers many advantages for the establishment of a small Experimental Garden, as suggested by Dr. Royle, and if a spot of ground, on an inclined plane, were selected for the purpose, I am satisfied that many useful and highly ornamental extra-tropical plants and trees might thus be gradually introduced into India.

That splendid tree the *Arancaria excelsa*, Norfolk Island Pine, thrives remarkably well at St. Helena, and so does the *Camellia Japonica*, from St. Helena: these plants are being gradually introduced at the Cape of Good Hope, and in proper situations will no doubt thrive very well. On my return I brought many seeds with me, among others the *Acacia lophanta* ; an Australian Acacia, and also Virgilia Capensis, indigenous at the Cape. I distributed the seeds to the Barrackpore Park gardens, to Darjeling, Saharanpore, &c. but I have not heard if they have thriven ; that they have vegetated I know, having sown several myself which came up before I left Barrackpore, but the migrating nature of a soldier's life is very unfavorable to horticultural pursuits. At Jumaulpore however (having been three years at the station),

I had an opportunity of forming a very good ornamental garden, and overcame the difficulties opposed by the soil, by digging deep pits, of three or four feet diameter, for every plant that was expected to attain any size. Weeds and leaves were never thrown away, but all deposited in trenches dug in the intervals between plants, and I found the soil produced by the decomposed vegetable substances, far superior as a manure, as it had sufficient richness to excite growth, without any of the *heat* which often accompanies the other, except when very old. Another advantage decomposed vegetable mould possesses is, that it is not so likely to generate or attract white ants, as stable manure.

Native malees are generally satisfied with the ordinary mode of irrigation common in India. I have however invariably found great advantage result from hand watering; as cleansing the leaves and stem of young and delicate shrubs from the accumulated dust, with which in the dry hot weather they are frequently covered, is as essential to their health and growth, as ablution to the human body. I am induced to recommend an inclined plane as best adapted for an Experimental Garden, from having remarked the perfect success which attended some Geraniums I planted out in 1830. In front of my house at Almorah, there was a sloping bank on which I planted several Geraniums, they were out the whole of the rains and all the winter, being protected during the latter period by thick covering of straw; and although in February, 1831, there was eleven inches depth of snow round them, when the straw was removed in March, they were in the finest condition possible. Any one in this country, who has cultivated Geraniums, must have remarked, that the stem frequently decays just above the ground; I attribute this to the injudicious mode of watering adopted in this country. In England, each flower pot has a saucer, into which the water intended for the nourishment of the plant is poured, here the

water is poured over the earth in the pot: a very simple remedy is available in India, and will completely supply the absence of saucers to flower pots, viz. by inserting in the earth of the flower pot a small piece of hollow bamboo, with the lower extremity perforated with three or four small holes, which will gradually allow the water in the bamboo to percolate through to the roots of the plants.

I do not think that the Coffee plant has ever had justice done it in India. The climate and soil of Bengal are manifestly not congenial to its habits, and I think the following extract from Mr. Cruttenden's interesting narrative of his visit to Sana in Arabia (where unquestionably the best is produced) will bear me out in the assertion. The narrative is in part 3d, vol. 8th, Journal of the Royal Geographical Society:—"The valley now became much narrower, in many places not exceeding twenty yards in width, while the mountains on either side rose to the height of 1200 or 1400 feet above the plain, thickly wooded to within 200 feet of their summit, when they presented a barren sheet of grey limestone rock. Under a huge mass which had fallen and completely blocked up the valley, we found a Coffee house and two or three small huts. Understanding that there was a Coffee plantation in the neighbourhood, and of the very best quality, we gladly availed ourselves of the suggestion of Shaikh el Júadí, and halted there for the day. A scrambling walk over the before-mentioned rock, by means of steps cut in it, brought us to the Coffee plantation of Dorah. It was small, perhaps not covering half an acre, with an embankment of stone round it to prevent the soil being washed away."

"The Coffee plant is usually found growing on the side of any valley or other sheltered situation, the soil which has been gradually washed down from the surrounding heights being that which forms its support. This is afforded by the decomposition of a kind of claystone slightly porphyritic.

which is found irregularly disposed in company with a kind of trap rock, among which as we approached Saná, basalt is found to predominate. The claystone is only found in more elevated districts, but the *detritus* finds a ready way into the lower tract by the numerous and steep gorges that are visible in various directions.

"As it is thrown up on one side of the valley, it is then carefully protected by stone walls, so as to present the appearance of terraces. The plant requires a moist soil, though I believe much rain is not desirable. It is always found growing in the greatest luxuriance where there is a spring in the vicinity, for in those plantations where water is scarce the plant looks dry and withered. The bean is gathered twice a year, and we were told that one of the Dorah trees, though of the small quality, ought to produce in the two crops at least ten pounds, or a Saná maund. We found the fig, plantain, orange, citron, and a little indigo growing among the coffee. A stream of water from a neighbouring spring was drawn through the garden, and we were told that the roots of each plant were regularly watered every morning and evening. The plant is said to live six years, three of which are requisite for bringing the tree to perfection, for three it bears, and then dies and is rooted up. Thermometer in the shade 75 deg. Dorah, North Latitude about 15 deg. 5 min."

In addition to the above I may add, that I learn from a friend who resided some years in Java, that elevated sites, and a command of water for irrigation, is invariably selected for Coffee plantations.

In 1835, I received at Jumalpore a few Coffee plants from Dr. Wallich, they were about twelve or fifteen inches in height when I put them into pots prepared by the removal of the substratum of clay. As the plants grew I pruned all the lower branches, leaving about two feet of the *stem* perfectly clear of branches. In 1837, from about six plants,

averaging from three to four feet in height, I collected about seven seers of Coffee, of which I have sent you a specimen by dawk banghy. Although the Coffee cultivation has failed in Bengal, it does not necessarily follow that it would fail in other parts of India, and I think the Rajmahl Hills, the Guruckpoor Hills near Monghyr, the lower range probably at Darjeling, and the whole of the southern portion of the Kumaoon Hills, present localities well adapted for the successful culture of this valuable plant. Should it be tried and secured in the Rajmahl Hills, it would introduce a new and valuable source of wealth into an extensive and hitherto unprofitable tract of jungle; and I sincerely hope, that some enterprising individual will be induced to give the Coffee plant a fair trial in soil better suited to its habits than that of Bengal.

I shall most probably be obliged to visit Europe during the ensuing cold season on account of my health, and if the Society wish to send home any seeds, I shall have much pleasure in taking charge of them and keeping them in my cabin, if they are put up in cases about six inches in depth and twelve or fifteen inches square; of this size they can easily be triced up between the beams of a cabin, have free air, and be in nobody's way. I have found raw sugar a great preserver of seeds, by putting the seed papers in open-mouthed bottles and filling the interstices with the sugar, and corking the bottle tight.

I had the following *Cape bulbs* in flower in April and May. Voltotta purpurea, Albecca major, Ornithogalum niveum, a Zachenalia, and several others, thriving well when I was obliged to change my residence.

Note on the progress making in the Provinces of Gurhwal and Kumaon in the Cultivation of the Tea Plant. Communicated by LORD AUCKLAND.

1. The first place at which the plant may be seen is Paori near Sreenuggur, in the private grounds of the Assistant, Captain Huddlestone, on an elevation of about 6,000 feet.

2. There are some hundred strong and healthy looking plants and seedlings, but none as yet of a growth to yield seed.

3. The next place where the plant is to be met with is in a garden attached to the Commissioner's bungalow at Lohba.

4. Here at a height of about 5,000 feet there are about as many plants as at Paori, and all of the same healthy appearance and at the same stage of their growth.

5. At Almorah there are two gardens belonging to Government, the one the Luchmesur, the other the Kupeena garden.

The first covers three acres in extent, and contains 1,500 full grown trees yielding seed, and 20,000 growing seedlings; the second stands on eleven and half acres, and has in it 700 layers taken from the other garden, and 500 seedlings.

6. There is also near Almorah a private garden belonging to Mr. Blinkworth, in which there are some 40,000 seeds sown and expected to come up in the summer of 1842.

The fourth, and perhaps most eligible site with reference to its position as being nearest to the plains, is at Bheemtal, where there are two gardens, one called the Bhurtpoor garden of three acres, contains 300 trees yielding seed, 700 layers, and 200 seedlings, the other the Russeah garden, on the Now Koorcha lake, of six acres, has 5,846 thriving seedlings, and 20,000 seeds sown, and expected to come up in the summer between March and July.

7. In the vicinity of this last garden in the semi-circular slope of the mountain to the north and east of the new Koor-

cha lake, a great extent of irrigatable land, proved to be favorable to the growth of the Tea plant, is to be had at the distance of only one march from the plains, and at an average elevation of about 4,000 feet.

8. In the several gardens, not of too recent formation to have trees yielding seed, there are calculated to be not less than 50,000 seeds nearly ready to be gathered, and that almost all of these will germinate, may be concluded from the produce of what have last year been sown and are now coming up.

9. On the whole the experiment, in as far as the possibility of rearing the Tea plant in the provinces of Gurhwal and Kumaon is in question, may be safely pronounced to have completely succeeded.

10. The quality of the leaf and the difference in this respect between the produce of the gardens near Bheemtal where snow seldom if ever falls, though the frosts sometimes are severe, and that of the gardens near Almorah and in the interior, which are annually exposed to snow as well as frost, can only be ascertained by the employment of properly qualified persons who can subject the article to the usual tests.

11. Assam has doubtless a great advantage over Kumaon as to facility of export, but the latter province will probably be found to yield a produce of a superior quality.

12. But even if its superiority in this respect should not be found to counterbalance the disadvantages of the situation of Kumaon, in as far as foreign markets are concerned, still when the liking evinced by all classes of the Native population for Tea is considered, the gradual growth of demand nearer home does not appear to the an improbable consequence of such an extension of the cultivation of the plant in the mountains, as may furnish the inhabitants of the plains with the means of indulging at a moderate cost in what would then soon become a favorite beverage.

The slowness of the people of India to adopt any new habit, especially in regard to their food and refreshments, is well known; but there was a time when tobacco was unknown, and potatoes not very long since, were regarded with suspicion, yet the one has become a necessary of life, and the consumption of the other is rapidly encreasing.

On the properties of the "Dowree" Plant and Olibanum Tree. By Brigadier GEO. TWEMLOW, *of the Nizam's Service. With further remarks thereon, by* N. WALLICH, M. D., F.R.S.

(Presented to the Society.)

When on the Mahabaleshwur hills in 1836, I was informed by a Chinese, (one of the convicts located there) that they, the Chinese, use an infusion from the leaves of a shrub found on those hills, as a substitute for tea, and when enquiring of the hill tribes inhabiting the hills north of Ellichpoor, I am informed that they, the Goands, drink an infusion from the leaves of a plant, they call the "Dowree." Having obtained some of the leaves, after infusion, it has struck me, that there is sufficient resemblance to warrant my troubling you, with a communication on the subject, and with the view also to bring to the notice of the Society, that on these hills, the Olibanum tree, the Boswellia thurifera, grows in great abundance; that it can be propagated from cuttings to any extent, that it produces a gum resin which can be made into tapers, or if made into bricks admixed with charcoal, would make a substitute for fuel.

I have not been able to procure either the seed or flower of the "Dowree," at present the flower is said to be red not white; but I send some of the leaves, and if you could put me in the way of obtaining a few leaves and seeds of the true tea tree, I would endeavour to ascertain whether I am right in my conjecture, that the tea trees, if not indigenous on the

hills near the Taptee River, and north of Ellichpoor, yet might be reared with success.

I have the pleasure to forward a small brick of Olibanum, admixed with charcoal; it will burn, though the proportion of charcoal is too great perhaps. I have long been impressed with the idea, that where fuel is dear, artificial coal might be made, and moulded into any convenient form, and forests be thereby thinned for cultivation.

The Officers of the Ellichpoor division of the Nizam's army have erected six bungalows on the hills, the climate thereon, in May, being cool and refreshing—the distance from the cantonment is only 22 miles—the registered difference by two thermometers is 10 deg., but to the feelings much more, neither tatties nor punkahs being required. The houses are on a plateau about two miles north of Gawilghur.

REMARKS BY DR. WALLICH.

The letter from Brigr. Twemlow which you kindly sent me yesterday with the specimen of "Dowree" enclosed, are very interesting, both as far as the latter is concerned, as well as on other points.

The specimen is of an elegant shrub, or small tree, called by Dr. Roxburgh Grislea tomentosa in the plants of the Coast of Coromandel, and afterwards in his Flora Indica, vol. II. p. 233. It was known to Linneus who referred it to Lythrum, and Dr. W. Hunter, in a paper in the 4th volume of Asiatic Researches, on the Morinda or Aal, mentions that the flowers of our shrub are added as a dyeing ingredient to the Aal; he gives at the same time a good description of the flower, and expresses a suspicion, that the shrub may perhaps form a distinct genus. You will find all these references in Roxburgh's works. Hunter says it grows wild on hills in Malwa, and is called D'hawry. The Sanscrita names are given in Roxburgh's works quoted above, and also in his Hortus Benga-

lensis. I will only mention here, that Dhub and Dhauphool are given as the Bengalí and Dhuwi as the Hindí names.

It is possible that the Mahabaleshwur shrub may eventually prove a distinct species—although I doubt it. The leaves (all that Brigr. T. has sent) seem to be more dotted below and perhaps more pubescent than our plant; but that is not of importance as a specific distinction. Dr. Hamilton has a species which he calls Grislea punctata, with smooth leaves, but even that I doubt to be separable from ours. I say this with the most profound veneration for that great authority.

The employment of the "Dowree" as a succedanum for tea, is very curious. Fortunately I happen to have an excellent specimen of the genuine China tea in fruit, by me, which I will send to Brigr. Twemlow. I got it a short time ago from Mr. Hodgson in Nipal. I now return the letter and specimen, with my best thanks for the perusal and examination.

Memorandum on Lichens from Darjeeling. By A. CAMPBELL, ESQ., *Superintendent of Darjeeling.*

(Presented to the Society by LORD AUCKLAND.)

I am directed by the Right Hon'ble the Governor General to send you the accompanying memorandum of Darjeling Lichens, sent down by Dr. Campbell; and particularly to call your attention to his remarks upon one said to resemble a lichen used as a red dye in the highlands of Scotland. These Lichens have been, and now are being, experimented upon by Mr. Piddington and Dr. Mouat,* who intend, I be-

* Dr. Mouat's report was sent in to Lord Auckland, with specimens of the dyes obtained, and small pieces of Silk, in which the colour had been fixed by means of the ordinary mordants used by dyers. Some of the liquors obtained, were presented to the Society, and have since, apparently by the action of light, changed to very beautiful shades of crimson and lilac. The subject is one of much interest, and we believe, Dr. Mouat is still engaged in making further experiments upon it, a special report of which will be presented to the Society when ready.—ED.

lieve, to send their reports to the Agricultural and Horticultural Society.

List of Lichens sent to Lord Auckland from Darjeling in June, 1841.

No.	1,..	Tree..	Lichen..	Grey..	Oak Lodge.
No.	2,..	Do. ..	Do.....	Do. ..	Do.
No.	3,..	Do. ..	Do.....	Do. ..	Mr. Smoult's.
No.	4,..	Do. ..	Do.....	Green .	Auckland Road.
No.	5,..	Rock .	Lichen..	Do. ..	Ditto ditto.
No.	6,..	Tree .	Do.....	Grey..	Dr. Campbell's.
No.	7,..	Rock .	Do.....	Do. ..	Darjeling Hill.
No.	8,..	Do. ..	Do.....	Green .	Mr. Cameron's.
No.	9,..	Tree .	Lichen..	Do. ..	Eden Falls.
No.	10,..	Do. ..	Do.....	Grey..	Rungpoor.
No.	11,..	Tree. .	Lichen. .	Green..	Rungpore.
No.	12,..	Do. ..	Do.....	Do...	Do.
No.	13,..	Do.. .	Do.....	Grey..	Do.
No.	14,..	Do.. .	Do.....	Do. ..	Lebong.
No.	15,..	Do.. .	Do.....	Do. ..	Do.
No.	16,..	Do.. .	Do.....	Do. ..	Do.
No.	17,..	Do.. .	Do.....	Do. ..	Do.
No.	18,..	Rock.	Do.....	Do. ..	Darjeling Hill.

The procurable quantity of all these sorts is very great. The green ones especially, both rock and tree, are in boundless profusion, and if it happened that they were of any use in the arts, they might be floated down the Mahanuddeh and Ganges, in stocks like the Cotton of Mirzapore, being first screwed down or pressed.

The Grey Tree Lichens sent, have all been found on the upper branches. The green ones pervade stem and branches alike. Grey ones are rare on the stems, and I have not observed green and grey ones on the same branches.

No. 13, a beautiful Lichen—has, when fresh and moist, a strong smell of sea weed.

No. 18 is used by the mountaineers as a healing application to wounds. It reminds me of a rock Lichen, which abounds in my native Highlands, and from which a dirty red dye is made by boiling it with fern ashes. The Lichen is called "Ceothal" in Gaelic, and the dye bears the same name. It is used, or was in my time, for dyeing blankets and the coarse woollen of the poorer people.

The Lebong Lichens, Nos. 14, 15, 16 and 17, were gathered at, say 800 feet lower than Darjeling. The two latter are from Beech trees.

On the propagation of the Vine. By the Reverend — HANDS, *Missionary at Bellary.*

Vines are sometimes propagated in this country by layers, but the more general method is by cuttings. These are procured at the time of pruning, which is usually in the months of October or November. The cuttings should be about 14 or 16 inches in length, and placed in a slanting position, about three fourths of their length, in the ground, so as to leave only three or four buds above the surface. They should be planted about 18 inches apart, so as to leave room for transplanting them, without injuring the roots. The soil in which the cuttings are planted should be light, and well manured, and they should be moderately watered every 2 or 3 days; when they have taken root they will probably throw out three or four shoots, the strongest and most healthy of which, as soon as it can be ascertained, should be selected for the stem of the future Vine, and all the others carefully taken off. This, should be trained and supported with much care by a bamboo or stick, and the lateral shoots taken off as they make their appearance, till it has attained the height of the *pandall* against which it is to be planted. In 10 or 12 months they will be ready for transplanting, or if necessary, might be removed earlier without injury.

The *Pandalls* used in this country, are generally about six feet high, but I think one much lower is preferable. At Bellary I have one, six feet in height, and three of four feet, and I have invariably found the latter to answer best; on this, neither the blossom nor the fruit are so much exposed to injury from blights or strong wind, and I have generally found the fruit more abundant, much finer, and to ripen better on the low than on the high *pandalls*.

At Bellary we commence pruning as soon as the rains cease, in October or November; and, as we have several *pandalls*, leave an interval of about a fortnight between the pruning of each; by this means we obtain a constant succession of fruit, from about the middle of March to the end of June.

In pruning, much care and judgment should be exercised, all dead and useless wood should be carefully taken away. In general all the last years shoots (except where the Vines are very young and the *pandall* bare) should be cut away within a few inches of their commencement, leaving from two to four or five buds only. On those branches which are strong and healthy, four or five buds, or eyes, may be left, but if small and weak, not more than two or three; almost all the native gardeners err in pruning Vines much too sparingly. By leaving too much wood the Vine is weakened, and the fruit degenerates. There may be a few more clusters, but they will be small and inferior.

I should have mentioned, that previous to pruning Vines, their roots should be opened, and laid bare about 18 inches round the stem, and if they are five or six years old or more, may remain open 12 or 14 days: this will lessen the sap and cause the leaves to fall off. If they are very young, six or eight days may be sufficient.

When the roots of the Vines have been bared a sufficient time, then prune them, and at the same time, trim the roots also, by removing with the knife all the little fibres which surround

the larger roots and have been thrown out during the last year, leaving only the larger roots. After pruning, let the branches be properly disposed in the *pandall,* and tied in their places, that they may not be afterwards displaced and broken, by the winds.

It is customary with many persons to use a very rich and expensive compost for their Vines, composed of fish, toddy, &c. &c. &c., but this does not appear to me at all necessary. The manure used for the Vines in the Mission garden—composed of about two-fourths of red earth, one-fourth of sheep's dung, and the other fourth of about equal parts of common manure, and the contents of sheeps stomachs collected from the slaughter house—is usually collected about three months before pruning time, and thrown together to give it time to ferment and rot.

In addition to this, I sometimes put a small quantity (a quart or two) of sheep's blood to each root, before the manure is thrown in, and I think it is an improvement. When all is ready, the hole is filled up with the manure, leaving a sufficient space to receive the water. When manured they should be watered as soon as possible, and to prevent too great a degree of heat or fermentation some water should be given daily for two or three days: afterwards once in three days will be usually sufficient.

After the fruit is set, it will considerably improve it to examine the Vines frequently, and pinch off with the finger and thumb the numerous useless shoots on the fruit-bearing branches, which will continue for some time to rise, and if not removed, will not a little impoverish the fruit, and entangle and shade it too much.

Care also should be taken, while the fruit is growing, and especially while ripening, to keep the ground clean under the *pandall,* and clear from weeds, &c.

NOTES AND SELECTIONS.

Chemical Examination of the Juice of the Sugar Cane grown in France and the Antilles. By M. Osmin Hervy.

(Translated from the Journal de Pharmacie.)

The juice of the canes submitted to analysis, was colourless or of a very pale yellowish white, exhaling a sweet balsamic odour, and possessing an agreeable, but somewhat mawkish taste, with an acid reaction.

The juice was clarified by the aid of heat alone. On the addition of alcohol a very light flocculent precipitate was formed, and acid applied either cold or hot, clarified it, throwing down a light precipitate. Lime and the alkaline carbonates clarify it equally well, but it was remarked that either a weak or concentrated solution of pure caustic potash, clarifies the juice more perfectly the higher the temperature is elevated, proving that the matter which is coagulated and produces the clarification, is neither albumen nor pectin.

Tannin occasions a scanty precipitate in fresh juice, but a copious one in juice which has been extracted for some days, and has begun to thicken. Alcohol exerts a similar reaction.

Animal charcoal decolorizes cane juice, and renders it perfectly limpid, without destroying its taste. When thus decolorized and clarified by ivory black, it is no longer precipitated by tannin, and can be kept for more than fifteen days at a temperature of 50° F. without undergoing any change: if the temperature, be higher at the end of five or six days it undergoes the vinous fermentation, but never thickens.

The acetate of lead produces an abundant precipitate from the juice of the French cane, and the supernatant fluid, immediately becomes clear. Every experiment leads to the conclusion, that the juice of the colonial cane, has a very different re-action with the acetate of lead, because all the specimens of dried colonial cane subjected to examination, produce inserted aqueous liquors which were sparingly pre-

cipitable by the acetate of lead, and the supernatant liquor either remained turbid, or was not clarified, without great difficulty even by filtration. The dried French cane, when treated with the same reagent, gave a perfectly clear solution.

The juice of French cane undergoes the vinous fermentation with difficulty *per se;* when left to itself, it soon begins to thicken, becoming of a gummy consistence, and the sugar diminishes in proportion to its thickening, until it ultimately disappears altogether.

This can be proved experimentally by treating the mass with alcohol at 185° F. which causes the new substance to coagulate, and holds in solution the sugar still existing in it, as well as the lactic acid generated during the decomposition. Sulphuric acid checks this process, while alkalies, even the caustic ones, appear to favour it. The substance coagulated by the alcohol, when washed in it, is white, soft, elastic, soluble in water and in acetic acid. It very closely resembles gum thrown down from a watery solution by alcohol, and is copiously precipitated by tannin, alcohol and ether : it is charred by sulphuric acid, and converted into oxalic acid by nitric acid.

Under the influence of a temperature from 77° to 86° F. with common yeast, the vinous fermentation is developed in the cane juice, but it must be particularly borne in mind, that the juice treated with animal charcoal never undergoes the viscid fermentation, and may be preserved for a long time without change ; while, the simple juice rapidly passes into the viscid state above described. How does it happen then that rum is obtained with so much facility from molasses ? This arises from heat operating in the vinous fermentation in the same manner as charcoal, which opinion is based on the following experiment : 100 grammes* of cane juice S. G. 1.040 at 55° F. were taken and divided into two equal parts, which were then evaporated to a third of their respective weights, the one by boiling in the open air, the other at the ordinary temperature under a bell jar, the watery vapour being absorbed by means of quick lime : they were then restored to their original density by the addition of distilled water, and at the end of five days at a temperature of 59° F. fermentation had already commenced in the liquor which had not been subjected to heat, while the other at the end of 15 days, did not exhibit any indication of the phenomenon.

* The French *Gramme* is equal to 15.4 English grains.

On the Physical Properties of Soil, and on the Means of Investigating them. By Professor SCHUBLER, of the University of Tübingen.*

[The present paper differs from those which have come before, as belonging to the theory, not to the practice of husbandry; and attempting, therefore, to ascertain, not what are the means by the employment of which we may succeed in effecting a particular object, but what are the laws of nature under which all our operations are to be carried on. Both these branches must be followed out together, but distinctly, in order to render our science complete. Theory must not pretend to teach the occupier of land how be is to manage his farm; but so neither should the abstract inquirer, while he keeps within his own bounds, be regarded as visionary by the practical farmer. Some of the results brought out in this paper are striking, others will appear inconsiderable; yet even these last must not therefore be condemned as useless, because it is essential that, in speculating on the causes of such effects as come before us in actual husbandry, we should know not only what hidden powers of nature are operative, but also which of them are incapable of exerting any considerable influence on vegetable or animal life; just as a map points out to the sailor not only those openings of the coast which will afford him a passage, but those also which he must not enter because further progress is barred.—PH. PUSEY.]

SOILS are essentially different in their elementary nature, according to the particular earths which they contain, and the various proportions in which those earths enter into their composition; but soils possessing the very same chemical elements may be endued with widely different properties, in an agricultural point of view, according to the mechanical state of fineness or coarseness of their particles, and the degree of looseness or firmness of texture resulting from their mode of union. The investigation of these *physical properties*, as they are called, is of the highest importance in bringing us acquainted with the nature of soils and the various means within our power of modifying and improving them according to the given cir-

* This dissertation forms the Second Section of "Agronomy," in a German work entitled, "Principles of Agricultural Chemistry, in more direct reference to the Economy of Agriculture and Forestry," by Professor Schübler, of the University of Tübingen: second edition, revised and improved by Professor Krutzsch, of the "Forest and Agricultural Academy of Tharand," in Saxony, 1838. Translated from the German by the Secretary and Editor of the Society; who has great pleasure in acknowledging the essential obligations under which his version is laid, in its literary character as well as in its scientific points of interest, by the suggestions, revision, and friendly criticism of Philip Pusey, Esq. M. P. one of the members of the Journal Committee.

cumstances of the case or the intentions which the cultivator of the land has in view.

The several physical properties which may be supposed to exert a greater or less influence on the fertility of soils, and which on that account we shall more closely investigate, are the following:—

I. The weight of the soil; its specific gravity, as well as the absolute weight of a given bulk in a dry and moist state.

II. Its power of containing water, according to weight and bulk.

III. The firmness and consistency of a soil in its dry and in its moist state.

IV. Its different capability of becoming dry on exposure to the air.

V. Its diminution in bulk on drying.

VI. Its absorption of humidity from the atmosphere.

VII. Its absorption of oxygen from the atmosphere.

VIII. Its power of retaining heat.

IX. Its capability of becoming more or less warmed by the sun's rays.

X. Its capability of developing heat on being moistened.

XI. Its electric polarity and capability of conducting electricity.

We will now consider these several properties more narrowly, and give the process of testing soils in regard to them; to which we will subjoin a comparative arrangement of them, in reference to those earths and soils which come most frequently under the notice of the agriculturist: we have selected for this purpose,—

1. Siliceous sand.
2. Calcareous sand.
3. Finely powdered carbonate of lime, obtained from burnt limestone, which, by long exposure to the atmosphere, has returned to the state of perfect carbonate.
4. A common grey clay, consisting of 68 per cent. of silica, 36.2 of alumina, and 5.8 per cent. of protoxide of iron.
5. Stiff clay or brick-earth, loam, and sandy clay.
6. Earthy gypsum, or gypsum-powder, resulting from the pulverization of the natural white gypsum.
7. A somewhat fine-slaty, red-brown clay marl, frequently found in the Keuper formation of Würtemberg, consisting of 84.8

per cent. of clay with oxide of iron, 6.5 per cent of carbonate of lime, 7.2 of carbonate of magnesia, and 1.3 per cent. of loosely combined oxide of iron.

8. Humus, or humic acid; and with these investigations should be connected the animal-vegetable humic acid, which is known to be of especial effect on vegetation.
9. Carbonate of magnesia, obtained from the precipitation of solutions of magnesia in acids by alkalies.
10. A fertile, light, black garden-mould, consisting of 52.4 per cent. of clay, 365 per cent. of siliceous sand, 1.8 per cent. of calcareous sand, 2, per cent. of lime, and 7.2 per cent. of mild humus and organic remains.
11. A common fertile arable soil, consisting of 51.1 per cent. of clay, 42.7 of siliceous sand, 0.4 of calcareous sand, 2.3 per cent. of lime, and 3.4 per cent. of mild humus and organic remains.

In testing the several properties, we employed, for comparison, white pipe-clay, as one of the purest native clays; fine lime, prepared by precipitation of acid solutions, by means of alkalies; and several other kinds of earth, of which particular mention will be made when we come to discuss the special properties of soils, individually.

I. *Weight of the soil.*—In the determination of the weight of the soil, a particular distinction is to be made between the peculiar specific gravity of the several portions of earth and the absolute weight of a determinate volume, as of a cubic inch or foot of the several soils.

The specific gravity of an earth is not found by the mere weighing of a determinate volume, as, for example, of a cubic inch; and comparing such weight with that of an equal volume of water, for we should in that case always obtain too small a weight, as the interstices of every cubic inch of the earth, even when closely compressed, contain much air. The real specific gravity is obtained by the following process:—A glass bottle, with an accurately-fitted stopper, holding some 300 or 400 grains of water, is completely filled with that liquid, and the weight of the whole ascertained; now empty the bottle of half the water, and introduce into the half-filled vessel the soil to be investigated, and which had been previously weighed in its dry state; again fill up the bottle with water, and close it with the stopper as soon as it ceases after a few times shaking to give

out air-bubbles from the interstices of the soil, and determine now the weight of the vessel thus filled with soil and water; the specific gravity is found from the quantity of water excluded by the soil from the bottle, by a simple calculation: and we obtain the quantity of such excluded water by subtracting the sum of the weights of the dry soil and the vessel from the weight of the vessel filled with water. An example will best elucidate the process:—

The dry soil to be investigated weighs	240	grains.
The vessel filled merely with water weighs	600	,,
Therefore the sum of both is	840	,,
The vessel filled with the soil and water together weighs..........................	744	,,
	96	,,

Therefore the soil has excluded 96 grains of water from the bottle, or, in other words, 240 grains of soil require as great a space as 96 grains of water, and the weight of the water bears therefore to the weight of the soil the proportion of 96 : 240, or the specific gravity of this soil is 240-96=2.50, when we assume the weight of the water=1.

The actual weight of a determinate volume of soil, which is also called its absolute weight, is obtained simply by weighing a cubic inch or a cubic foot of the soil moderately compressed in the vessel. As the weight of the soil is always very different according to its different states of moistness or dryness, it is desirable to make this determination as well with soil fully dried at $144\frac{1}{2}$° F., as also with soil thoroughly moistened; we may consider a soil thoroughly moistened when it is laid in a wet state on a filter; and no longer allows any water to drop through.

Several of the previously mentioned earths exhibited the following differences in my experiments in reference to this point:—

Kinds of Earth.	Specific Gavity, that of Water being taken as=1.	Weight of a Cubic Inch.		Weight of a Cubic Foot.	
		In the Dry state.	In the Wet state.	In the Dry state.	In the Wet state.
		Grains.	Grains.	Pounds.	Pounds.
Calcareous Sand.	2.722	505	628	113.6	141.3
Siliceous Sand.	2.653	495	605	111.3	136.1
Gypsum Powder.	2.331	408	573	91.9	127.6
Sand Clay.	2.601	435	577	97.8	129.7
Loamy Clay.	2.581	393	551	88.5	124.1
Stiff Clay, or Brick-Earth. .	2.560	357	531	80.3	119.6
Pure Grey Clay.	2.533	334	515	75.2	115.8
Eine white clay (pipe clay)	2.440	213	454	47.9	102.1
Fine Carbonate of Lime. .	2.468	244	460	53.7	103.5
Fine Carbonate of Magnesia.	2.194	75	339	15.8	76.3
Humus.	2.370	154	346	34.8	81.7
Garden Mould.	2.332	364	457	68.7	102.7
Arable Soil.	2.401	376	529	84.5	119.1
Fine Slaty Marl.	2.631	498	624	112.0	140.3

From this Table we derive the following general results :—

1. Sand, either in its dry or wet state, is the heaviest part of arable soil, certain fine slaty marls approaching the nearest to sand in this respect.

2. Calcareous and siliceous sand differ but little in this point of view, calcareous sand, however, being the heaviest of the common constituents of arable soil.

3. The clays are lighter the more clay and the less sand they contain, and the contrary.

4. The lime always exhibits a great difference in weight, according to the fitness of its particles and the mode of its preparation; that obtained from slaked lime has a remarkably less weight, even when it has become again saturated with carbonic acid, the reason of which seems to be the great expansion of quicklime on its combination with water. That employed in this experiment lay for six years spread out flat in the state of a fine powder and exposed to the air. When lime is in close combination with carbonate of magnesia, as is the case in dolomite sand, the compound of these two earths exhibits a much greater weight than either of them in its separate state; the specific gravity of such kind of sand rises to 2.82

and 2.83, and even magnesian stony marls often possess this greater weight.

5. The carbonates of magnesia, as artificially obtained by preciptation from their solutions, exhibit indeed the least absolute weight among the usual ingredients of soil; in arable soils, however, magnesia is not found in this fine form, but usually in combination with lime or silica; in these two combinations it has a coarser form, the physical properties of which approach more nearly to those of sand.

6. Humus, among the usual constituents of soil, has the least specific gravity, and, if we except the pure artificial magnesia, it has likewise the least absolute weight.

7. Compound arable soils are generally lighter in proportion as they are richer in humus; we must not, however, conclude positively from this intimation alone as to the fertility of a soil, since the humus itself is liable to great differences, and even the other pure earths exhibit, according to the fineness of their particles, great diversity in weight, and consequently mixed earths may acquire very different average weights; a more certain evidence on this point is furnished by the specific gravity than by the absolute weight.

8. The usual denomination given by the farmer of heavy or light soils, refers neither to the specific gravity nor to the absolute weight of the earth; clay soils, in their dry as well as in their wet, state are of less weight than sandy soils; these designations, therefore, of heavy and light, refer much more to the different consistence of the earths, of which we shall say more subsequently.

Weight of artificial mixtures of earths.—When different earths are artificially mixed together, a cubic inch of the earthy mixture obtained gives a weight greater than the arithmetical mean (or common average) of the earths entering into the mixture, whether mixed in equal portions according to weight or volume, or in other quantities. I took, in different proportions, a common siliceous sand, a rich clay, and a fine clay-marl, of which I had previously ascertained the absolute weights, and mixed them together, when I determined the weight of the mixture. I obtained the following results :—

Kinds of Earth.	Weight of 5·7 Cubic Inch.	Arithmetical Mean.	Increase of Weight.
	Grains.	Grains.	Grains.
Common Siliceous Sand	2840		
Stiff Clay or Brick Earth	2020		
Fine Clay-marl	1790		
Clay and Sand in equal proportions by weight	2545	2430	115
Clay and Sand in equal proportions by volume	2685	2430	255
2 parts Clay and 1 part Sand by weight	2390	2293	97
2 parts Clay and 1 part Sand by volume	2470	2293	177
2 parts Sand and 1 part Clay by weight	2740	2566	174
2 parts Sand and 1 part Clay by volume	2825	2566	259
Equal parts of Marl and Sand by weight	2315	2267	48

This phenomenon is only to be explained by supposing a more intimate approach in the interstices of the contiguous earthy particles; something similar, therefore, seems here to happen with this mechanical commixture, to what takes place in a still higher degree with natural mixtures of earthy and rocky materials, for instance, with the dolomite sand and stony marls already mentioned, in which cases not only the absolute weight, but the real specific gravity also is greater than in the separate earths.

II. *Power of soil to contain water.*—We understand by the power of the earths to hold or contain water, their property of receiving and retaining more or less water within their interstices, without allowing it again to flow away by dropping: it is of the greater importance to vegetation, as on it depends the quantity of the means of aqueous nourishment the soil is in a condition to receive and supply to the roots of plants, and as the water itself is likewise one of the most essential sources of nutriment to plants.

The power of an earth to contain water may be found in the following manner: we take 400 grains of the earth to be investigated, and dry it at a temperature of about $144\frac{1}{2}°$ F., until it ceases to lose weight; in order to obtain results that may be compared easily together, it is desirable that the experiment be made with nearly equal quantities of each earth in its fine state, say, with about 400 grains or one cubic inch, because, when a large quantity is employed, the weight

alone of the earth occasions the pressure of a greater quantity of water out of it, and we should in such cases obtain different results for the same earth. We put this dried earth on a round filter consisting of unsized paper, and which has been previously weighed in its thoroughly moistened state, and laid, in a glass funnel, or on linen stretched over a frame. (See plate fig. 1.)

The latter mode is preferable, as the water poured on can more easily flow off, and it also allows the wet filtering paper to be raised up more easily and removed without tearing. We now pour over the earth lying on the filter distilled or rain-water, until it is fully moistened and saturated; and when it has ceased dropping, we bring it, while remaining in this wet state, on the filter, to the balance, to ascertain the weight of the whole; and then, by a simple calculation, determine the quantity of water absorbed, and power per cent. which the earth exhibits of containing water:—

Let the weight of the dry earth be.......	400	grains.
The weight of the wet filter..	110	,,
Sum of the two....	510	,,
The weight of the earth satured with water, and the filter..................	706	,,
Therefore the amount of water absorbed is,	196	,,

As 400 grains of this earth absorbed 196 grains of water, 100 grains of the same would retain 49, and the power of this earth to contain water would therefore be expressed by 49.

Should the earth on the filter absorb the moisture with difficulty, and receive it unequally into its interstices, it would be better to mix it in its dry and previously-weighed state with water in a glass vessel, and then pass it by degrees from this vessel to the filter.

When an earth contains much humus and salts of humic acid, it may be best to omit drying it before it is placed on the filter, as the humic acid has the property of taking up less water after it has been once thoroughly dried. In such a case the drying may be made the last stage of the process. But, in earths which contain only a small per centage of humus, as in the case with most arable soils, the power of containing water can be only very slightly affected by that

Fig. 1

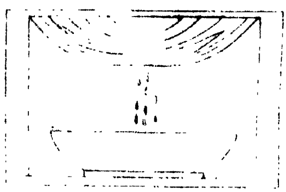


Fig. 2

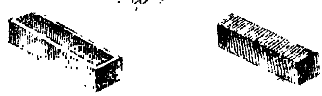
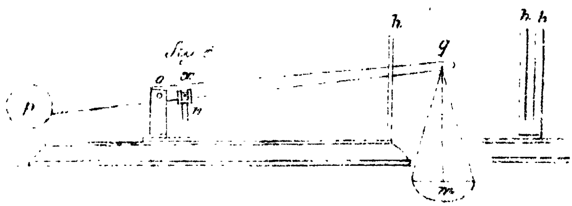


Fig. 3



circumstance; and by drying them in the first instance, we in fact obtain a far more decisive result, since it is thus only that we can be sure we have taken them in equal quantities. Clayey soils, too, absorb a different quantity of water according as they have been submitted in their half-moistened state to a different pressure and different treatment—differences which can only be obviated by previous drying and pulverization.

In an agricultural point of view, it is also of importance to know how much water a given bulk as well as weight of soil can take up, in order to be enabled to form a more correct judgment of the quantity which any given space of ground can absorb. This question is in every case easily answered when we know (by the method already explained) the determinate power of containing water by weight, and the weight itself also of a given bulk of soil in its wet state.* If we have found the power of containing water of siliceous sand equal to 25 per cent. and the weight of a cubic inch of the same in its wet state 605 grains; since 100 grains of this sand absorb 25 parts, the 605 grains, which form the cubic inch, will in like manner absorb 121 grains.

The following Table contains the results of the experiments which I made, in reference to this branch of the subject, with such soils as usually come under the notice of the agriculturist. I add, at the same time, to the list of these soils, the finely prepared carbonate of lime, obtained by precipitation from solutions in acids, and also pipe-clay, as representing one of the purest and finest of the clays:—

* It might appear, that this determination could be made by the mere comparison of the weights of a cubic inch of dry and wet soil, or from the absolute weight of a volume of the dry soil, and its power of containing water; we should, however, in this way obtain no correct result, because many soils, especially those containing clay and humus abundantly, contract considerably in drying, a cubic inch of such dry soils generally occupying a greater space in their wet state.

Kinds of Earth.	Power of containing water.		A cubic inch contains in the wet state.		A cubic foot of the wet earth contains of water
	According to weight.	According to volume.	Grains of water.	Cubic lines of water.	
	Per cent.	Per cent.			Pounds.
Siliceous sand	25	37.9	121	655	27.3
Calcareous sand	*29	44.1	141	763	31.8
Gypsum powder	27	38.2	122	660	27.4
Lime precipitated	47	54.5	174	941	39.1
Fine lime	85	66.1	211	1142	47.5
Fine magnesia	256	76.1	242	1316	62.6
Sandy clay	40	51.4	164	888	38.8
Loamy clay	50	57.3	183	991	41.4
Stiff clay, or brick earth	61	62.9	201	1088	45.4
Pure grey clay	70	66.2	212	1145	48.3
White clay, pipe-clay	87	66.0	211	1142	47.4
Humus	181	69.8	223	1207	50.1
Garden-mould	89	67.3	215	1164	48.4
Arable soil	52	57.3	181	980	40.8
Slaty marl	34	49.9	158	863	35.6

From this Table we obtain the following general results:—

1. The sands have the smallest power of containing water, whether they are compared in weight or in volume with the other earths: siliceous sand has the least power of them all; the sands themselves, moreover, differ according to the different fineness of their grains; with large-grained sand the power becomes diminished down to 20 per cent., while it amounts to 40 per cent. when the particles are exceedingly fine.

2. Gypsum powder very nearly approaches the sands in this respect and possesses even a somewhat smaller power of containing water than calcareous sand.

3. Slaty marl, notwithstanding the great proportion of clay it has already been remarked to contain, exhibits only a small power of containing water, and in this respect most nearly resembles sand of all the usual constituents of soil; and having this quality, it must be particularly calculated to render the soil both warmer and dryer:

these kinds of marl are accordingly frequently applied in the south-west parts of Germany to the improvement of vineyards.

4. Carbonate of lime exhibits great differences in its power of containing water, according to the fineness of its particles: it is therefore important, in investigations of soil, to make a distinction between the fine lime separated by decantation, and the earthy lime as found in the form of sand in an arable land.

5. Carbonate of magnesia, as found in arable soils, is not usually in so fine a form as that artificially prepared for, and used in, these experiments, but exists in a coarse-grained state in combination with lime or siliceous earth: when so combined, it possesses in a far less degree the power of containing water, and approaches in this respect to the character of the sands.

6. Humus has usually the greatest power of containing water of all the common ingredients of soil, and in a still higher degree is this the case when the humic acid has not been previously dried artificially, or when it is still mixed with a large proportion of half-decomposed organic matters, remains of wood, leaves, roots, &c.: 100 parts of the fine earth formed by decaying wood in old trees are capable of absorbing into their interstices nearly 200 and certain light turf-earths from 300 to 360 parts of water, even when they have been previously dried artificially; where we meet with a great water-holding power, one, namely, which exceeds 90, we may reckon with great probability on an abundant commixture of organic matter.*

III. *Firmness and consistency of soil.*—The firmness and consistency of soils is of considerable importance, in regard both to the fertility and to the working of land; the terms universally adopted in husbandry, of a heavy or a light soil, rest on these properties, and therefore deserve inquiry, with regard as well to the dry as to the moist state of the earth.

(a.) Firmness and consistency of a soil in its dry state.—The determination of the consistence of a soil is one of the more difficult problems, which in physical investigations of the earths ought the less to be neglected, since we can never hope to ascertain it by a mere

* On this property of soils see further Note A, p. 215

chemical process. Professor Völker proposed for this purpose, some time ago, a rather complex instrument,* of which the principal part is a kind of spade, the pressure and resistance of which on the field itself is determined by weight; this method cannot, however, be applied in comparative experiments of the consistence of individual soils, on a small scale.

Dr. Meyer (in his determination of the consistence of sandy soils) applies, with this view, a plate of four square inches in size,† furnished at its four corners with steel points rounded off below, and placed on a layer of soil three inches deep; the weights placed on the plate, which are required in order to force it into the soil, serve as the measure of this consistence: in the case, however, of stiff soils in a dry state, this method is attended with the inconvenience and difficulty of requiring very great weights to be laid upon the plate: with pure clay even 30 pounds are not sufficient for the purpose; while, in the case of very loose earth, the plate sinks too easily. In order to obviate these difficulties, Meyer proposes to submit the earths to this trial with an equal measure (5 per cent.) of water in each—a modification, however, which, in the execution of comparative experiments, has many difficulties.

Among the various methods which I have myself tried, I believe the following may be recommended as the most practicable in the generality of cases, and as applicable not only to the purpose of ascertaining the consistence of mixed earths, but also that of the clays, and even of very strong mortars.

We take the earths we wish to compare in a moderately and uniformly moistened state, and having prepared an open mould or socket of wood (or better of metal), open at the top and bottom, we form oblong square-cornered pieces (or little bricks), (see plate, fig. 2.) one-third of an inch in breadth and thickness, and about two inches long; we either leave these in the mould to dry of themselves, or remove them from it while in their fresh damp state (by the contrary pressure of a piece of wood of equal size and form); we then allow

* In the new 'Mögelin Annals of Agriculture,' vol. iv. p. 119, with a plate.

† See the sketch of this in the 'Flora of the Kingdom of Hanover,' p. 307, Cöttingen, 1822.

this moulded earth to dry first in the air and shade, and afterwards to become perfectly dried at a higher temperature of about 144½° F. The different degrees of firmness of the dried earths may now be more easily ascertained by the following simple instrument:—(See plate fig. 3.)

p q is a scale-beam 20 inches in length, *p* being a ball of lead, by means of which the scale-pan *m* on the longer arm is kept evenly balanced, so long as weights are not put into it; this arm of the balance has its movement within a fork-like section made through the upright piece, *h*, of which the fig. *h h* is the front view: *n* is of steel, blunt, spade-shaped in its termination, the 36th part of an inch in thickness, and one-third of an inch in breadth below (as corresponding with the breadth of the rectangular piece of moulded earth, to be submitted to trial); this little spade is secured to the beam at *x*, by a pivot, in such a manner that it always hangs freely straight down. The earth to be examined is now brought under the little spade, weights are put into the scale-pan until the earth is cut through; in the case of earths whose consistency is small, we must commence with drawn dram weights only; with earths of great firmness, the weight required will amount to several pounds; if we give to the beam, from *o* to *q*, a length of 12 inches, while the pivot-point of the little spade *x* is at the distance of one inch from *o*, the weight of a single ponnd put into the scale-pan will exert on the earth a pressure equal to the weight of 12 pounds; if we repeat the experiment several times, which we can easily do, with the rectangular moulded pieces of the same earth, and take the average of the whole, we shall obtain a result much nearer to the truth. The purest, densest, and heaviest clays to work, which I had occasion to examine by means of this instrument, required, in order to crush them, 4½ pounds in the scale—consequently, an actual pressure equal to 54 pounds.

If we designate the consistence found for the compactest clay by the number 100, the consistence of all the other earths may easily be referred to this as the standard; and thus, independently of the clay itself, we shall be able to institute comparisons between the consistencies of any of the different earths. The principal point is, to form pro-

perly and equally worked pieces of the earths to be compared, without too much water; and this, with a little practice, may easily be accomplished by means of the mould already mentioned.

The tabular view given at the termination of the following paragraph, contains the consistencies obtained, according to this plan, of the simple soils most frequently employed in husbandry; a comparative investigation of the firmness of the different kinds of mortar by means of the same instrument, was communicated by me some years ago in an appendix to Alberti's 'Description of the Mountains of Würtemberg' (Stuttgart, 1826, p. 305), which also appeared in an abstracted form in Schweigger's 'Journal of Chemistry,' in 1827; only, with this difference, that in those experiments, I made *n* terminate in a seed point, instead of a short spade.

(b.) Consistence of soil in the moist state, and its attachment or adhesion to agricultural implements.—When land is worked in a wet state, we have not only to overcome the cohesiveness of the particles among themselves, but at the same time their attachment and adhesion also to the agricultural implements employed. If we wish to subject this property to a comparative trial, we may effect it in the following manner. We fasten large round plates, equal in size, made of iron and wood (as the two materials commonly used for agricultural implements), underneath the scale-pan of a balance, and put weights into the other scale until both are equally balanced; we now bring the plate into exact contact with a moistened earth lying beneath it, and put weights in to the other scale-pan until the plate is drawn away from the earth; the amount of such weights corresponds to the degree of adhesion, or to the difficulty of working the earth in its wet state; degree of this adhesion is often more considerable than would have been expected—an adhesion plate of three or four square inches required upwards of two ounces of counter-weight in order to draw it away from the surface of garden-mould: in the case of the heavier clays, the weight required was as much as five or six ounces. From the size of the plate employed in this experiment, it is of course easy to calculate the amount of adhesion for larger or smaller surfaces.

The following table contains the results derived from experiments made according to the foregoing plans, on the firmness and consist-

ence of earths; the amount of adhesion in the wet state is calculated in pounds on a surface of one square foot.

Kinds of Earth.	In the Dry State. Firmness, that of Clay being 100.	In the Wet State. Adhension to Agricultural Implements, on a surface of 1 Square foot; with Iron.	In the Wet State. Adhension to Agricultural Implements, on a surface of 1 Square foot; with Wood.
Siliceous Sand	0	3.8 pounds	4.3 pound
Calcareous Sand	0	4.1 "	4.4 "
Fine Lime	5·0	14.3 "	15.6 "
Gypsum Powder	7.3	10.7 "	11.8 "
Humus	8.7	8.8 "	9.4 "
Magnesia	11.5	5.8 "	7.8 "
Sand Clay	57.3	7.9 "	8.9 "
Loamy Clay	68.8	10.6 "	11.4 "
Stiff Clay of Brick-earth	83.3	17.2 "	18.9 "
Grey pure Clay	100.0	27.0 "	29.2 "
Garden-mould	7.6	6.4 "	7.5 "
Arable Soil	33.8	5.8 "	6.4 "
Slaty Marl	23.0	4.9 "	5.5 "

(c.) *General results from these experiments.*—1. If we compare the different consistency of the earths with their different weight previously given, we shall feel satisfied that the customary terms employed by the farmer of a heavy or a light soil are founded on this cohesion of the soil within itself, and adhesion to agricultural implements, and therefore rather indicate its property of being easier or lighter to work than its weight; the more or less easy penetration of the roots into the surrounding soil will probably be in the same proportion.

2. The consistency and firmness of soils in the dry and in the wet state increase in much the same rate; clay-lands, whether in the dry or wet state, are the most difficult to work, the sandy soils and those containing much humus being the most easy; when we have ascertained the consistence of a soil in its dry state, we shall be able to conclude with much probability respecting its consistence in its wet state.

3. The firmness and consistency of a soil are not in the direct degree of its power of containing water; individual earths, as fine lime and magnesia, and humus, notwithstanding their great power of containing water, possess but little consistency; we cannot, therefore, infer the one property from the other.

4. The consistency is generally the greatest in clayey soils; this, however, is not always the case, as the clays themselves exhibit great

differences according to the fineness or coarseness of their grain; fine slaty marl, notwithstanding its great proportion of clay, indicates only a slight consistence; even pipe-clay, although belonging to the purest of the fine kinds of clay, has a far smaller consistence than ordinary clay of arable soils; I found its consistence in the dry state, from the mean of several experiments, only 42, and therefore not half so great as that of the heavy grey clay of arable soils.

5. Light soils such as the sandy gain much cohesive power by moisture; even the purest sand, which in its dry state loses all its coherence and falls into a shapeless powder, regains a certain degree of cohesiveness on being again wetted; a damp climate, therefore, with a large average quantity of rain, will be found, under similar circumstances, more advantageous to sandy districts.

6. In the case of all the earths, the adhesion to a surface of wood is seen to be greater than to one of iron, a circumstance occasioned, without doubt, by wood, even in its finished state, presenting more points of contact than iron to the damp earth; this might appear to be contradicted, by land in wet weather being often more capable of being worked with wooden than with iron implements, such for instance as harrows; the reason of this, however, is to be sought, not in the smaller adhesion of the soil to the wood, but frequently in the circumstance of iron implements, from their greater weight, sinking deeper into the soil in wet weather than wooden ones.

Diminution of the consistency of soil by the penetration of frost.—When soil in its wet state is exposed to the effects of cold in winter, so as to be thoroughly frozen, this circumstance is found to exercise a considerable influence on its consistency; on being completely dried after this exposure, and submitted to the examination already mentioned for the trial of consistence, the degree of that consistence will be found considerably diminished; this is more particularly the case with clays and soils of great consistence; their firmness becomes diminished nearly one-half by exposure to frost: with loamy clay the consistence is reduced from 69 to 45 of the scale previously employed, with an ordinary arable soil from 33 to 20. The presence of moisture is essential for the production of this effect, as completely dry earths suffer no change by frost. The phenomenon is to be ex-

plained by the crystallization of the water in the interstices of the soil occasioned by freezing in consequence of which, the several particles of earth become forced from their position, and their points of contact are thus rendered fewer in number.

The beneficial influence of breaking up the earth before winter sets in, in order to make it more easy for the frost to penetrate the broken clods, depends on this diminution of consistency occasioned by the frost: but if a soil that has thus been rendered lighter by frost is worked in too wet a state in the early part of the spring, the beneficial loosening which had taken place is again lost since by such working the earthy particles are once more brought into intimate contact; this is the reason why it is of such lasting injury for a soil to be worked while the weather is too wet. The throwing-out, as it is called, of many plants from the ground in changeable winters, when but little snow falls, as so often occurs, in consequence of alternate freezing and thawing, receives its explanation also in this enlargement of bulk occasioned by the frost in the soil—the smaller plants being thus gradually raised up out of the soil, and their upper roots in consequence very often wholly laid bare of earth, and the whole plants on that account destroyed; plants having the advantages of stronger and more deeply penetrating roots, are consequently far less exposed to be thrown out by frost.

IV. *Capability of soils to become more or less speedily dry, or their power of retaining water.*—It is a question of considerable importance in vegetation, whether a soil gives up its acquired moisture again to the atmospheric air quickly, or retains possession of it for a long time in its pores. By the following process, this property may be subjected to a comparative examination. We place on a round surface of tin plate, having a raised border, a given quantity of the earth to be examined; having previously saturated this fully with water, we spread it out evenly, and ascertain the weight of the whole; we suffer it to remain for several hours in a closed room to evaporate, and again weigh it to ascertain the quantity of water evaporated during the time; if we make the experiment with many earths at once, we shall be able to institute a comparison among them with the greatest certainty in reference to this point. To

obtain accurately the quantity of water contained in the earth at the commencement of the experiment, we afterwards dry it perfectly in an artificial heat, and thus easily reduce the quantity of evaporated water to hundredth parts of that contained in the earth.

	Grains,
Let the weight of a wet earth be	310
The weight of the same earth after 24 hours	260
The weight of the perfectly dried earth	200

Therefore the amount of water evaporated in 24 hours will be 50

And the water in the earth at the beginning of the experiment 110

Since, in this case, 50 of the 110 parts of the water taken up have evaporated, the amount of water vaporized from 100 parts will be 45.5 parts. The following table contains the results of the experiments which I obtained, in reference to this point, with 200 grains of the several earths at a temperature of $65\frac{3}{4}°$; they were spread out over a surface of ten square inches. The second column of the table contains in one view the portions of time in which the several earths respectively became dry under exposure to the same temperature; I did not require a perfect state of dryness, as this, at a temperature of $65\frac{3}{4}°$ F. and in the open air, could not be expected.

Kinds of Earth.	Capability of drying. Evaporation from 100 parts of absorbed water, at $65\frac{3}{4}°$ F. in 4 hours.	Times required for 90 parts of water to evaporate (at $65\frac{3}{4}°$ F.) from 100 parts absorbed.	
	Parts.	Hours.	Minutes.
Siliceous sand..........	884	4	4
Calcareous sand........	75.9	4	44
Gypsum powder....	71.7	5	1
Sandy clay.......... ..	52.0	6	55
Loamy clay...........	45.7	7	52
Stiff clay, or brick earth.	34.9	10	19
Pure grey clay.........	31.9	11	17
Fine lime..............	28.0	12	51
Humus	20.5	17	33
Magnesia............ ..	10.8	33	20
Garden-mould.........	24.3	14	49
Arable soil............	32.0	11	15
Slaty marl............	68.0	5	53

General remarks on this property, with further experiments on the same subject. Hence we obtain the following deductions :—

1. The terms of a hot or cold, a dry or wet soil, rest chiefly on this property of earths : sand, gypsum, and slaty marl, of all the earths, are the quickest in becoming dry again ; on that account they form what are called the hot soils.

2. The carbonate of lime exhibits great differences in this respect, according to the different form in which it occurs in soils. Calcareous sand dries up very quickly, while fine carbonate of lime yields the moisture it contains far more slowly to the air ; the latter has however, independently of its chemical action on humus, the important advantage over clay of loosening the soil after it is dried.

3. This property of the earths to require a longer or shorter time to become dry, might seem to stand in the same relation as their power of containing water ; and with thin layers this is nearly always the case ; but with layers of some inches in depth, the proportion deviates considerably, the deeper layers in this case drying more slowly, according to their degree of consistency, and to their greater or less contraction on drying : clay soils with a large proportion of clay exhibit this variation in an especially striking manner.

In order to convince myself more accurately, by positive experiments, of this slower process of evaporation in the case of deeper soils, I placed ten earths of very different power of containing water in round tin vessels, equal in size, 1 inch in depth and 1¾ in diameter —allowing them, after previous saturation with water, to become gradually dry, in a closed room whose temperature varied from 65¾° to 72½° F. ; I determined their weight at the commencement of the experiment, after thirty-six hours, and at the end of four days. They gave off their moisture to the air, at first, according to that relation of their power of retaining water which had already been shown by the experiments with shallow layers ; as soon, however, as their upper surface had become in some measure dry, and they were contracted into a more or less diminished space, this result varied in the following different degrees ; for easier comparison, the power of containing water possessed by the earths employed in these experiments is here also annexed :

Kinds of Earth.	Water evaporated in 4 days.	Power of containing water of the earths.
	Grains.	Per cent.
Calcareous sand	146	29
Light garden-mould	143	89
Gypsum powder	136	27
Very light turf-soil	132	366
Slaty marl	131	34
Arable soil	131	60
Fine magnesia	129	256
Black turf-soil, not so light	128	179
White fine clay	123	70
Grey fine clay	123	87

Whence follows, that the different degree of looseness or consistency of the ground has a considerable influence on the more or less easy drying of deep soils; the garden-mould employed in these experiments, notwithstanding its great power of containing water, in which it stands near to pure clay, gave off again to the air far more moisture in the same time than the clays; likewise the turf-soils and magnesia, notwithstanding their great power of containing water, became dry again at a quicker rate than clays; the fine grey clay, after fourteen days, exhibited in these experiments still a damp surface while the surfaces of the turf-soils and magnesia became perfectly dry many days earlier: since the consistency of a soil, and its tendency to become contracted into a narrower space, exerts so great an influence on the drying of a stratum only one inch deep, this must, of course, be the case in a far higher degree with beds of soil having a depth of several inches.

V. *Diminution of bulk on drying.*—The greater number of soils become contracted into a narrower space on drying; and in consequence of this circumstance, cracks and fissures frequently occur in land, and have an injurious effect on the vegetation, as the finer roots, which often ramify horizontally, and not unfrequently supply to the plants the greater part of their means of nourishment, are, by such contractions, either laid bare of soil or torn asunder. In order to subject soils to comparative experiments on this point.

the following plan may be adopted: we either form of the earths, in their wet state, large cubic pieces of equal size, being at least ten lines (or ten-twelfths of an inch) in height, breadth, and length, and therefore 1000 cubic lines (or a little more than half a cubic inch) in content, or we let such earths be fitted and dried, one after the other, in an accurately-worked cubic inch; after some time, when the weight of these cubes of earth ceases to change by further drying, we measure the dimensions of the cube by means of a rule on which the tenths of lines can be distinguished, and may thus calculate easily the volume of the earth, and consequently find the diminution in bulk which has been caused by the drying.

The experiments I made with the simpler earths, exhibited on this point the following differences :—

Kinds of Earth.	100 cubic lines became diminished in volume to	1000 parts therefore diminished in volume by
Siliceous sand.	(no change)	
Calcareous sand.	(no change)	
Fine lime.	950 cubic lines	50 parts
Sand clay.	940 ,,	60 ,,
Loamy clay.	911 ,,	89 ,,
Stiff clay, or brick earth.	886 ,,	114 ,,
Grey pure clay.	817 ,,	183 ,,
Carbonate of magnesia. .	846 ,,	154 ,,
Humus.	800 ,,	200 ,,
Garden-mould.	851 ,,	149 ,,
Arable soil.	880 ,,	120 ,,
Slaty marl.	965 ,,	35 ,,

General remarks.—1. Gypsum, in this respect, is seen to be very similar to the sands, and diminishes its volume in a very inconsiderable degree.

2. Fine carbonate of lime, notwithstanding its great power of containing water, gives on drying only a very small diminution of bulk, not by any means so great as that of clay; this property of the earths does not stand, therefore, in the same proportion with their power of containing water, and in as little with the firmness

and consistency of the soil; humus, notwithstanding its little consistency, exhibits on drying a remarkable degree of contraction.

3. Among those earths which are free from the humus, clay is the one which gives the greatest diminution of bulk on drying; an addition, however, of sand, or of carbonate of lime, diminishes this property considerably.

4. The tendency of many kinds of marl to fall into numerous small pieces on drying may be explained from this great difference which clay and lime, the elements of marl, experience in their diminution of bulk on drying after having been moistened; these individual parts changing their volume in a different degree, and thus occasioning a more easy disintegration of the natural compound we call marl.

5. Humus, of all the usual ingredients of soil, experiences on drying the greatest diminution of bulk, contracting one-fifth of its volume on being dried, and again expanding in the same proportion when moistened with water; this explains the reason why the upper surface of the earth in damp turf bottoms, containing much humus, frequently rises or sinks several inches accordingly as the soil is penetrated with more or less water, and why this elevation of wet turf-soils becomes still more remarkable, when a sharp frost sets in after wet weather, the freezing, by its expansion, still further increasing the volume of the particles of water which had previously penetrated the turf; hence, too, the reason why these turf-bottoms have in their wet state a remarkable elasticity if heavily trodden upon, and often occasion, in consequence of that yielding property, the feeling of fluctuation.

[To be continued.]

On the Selection of Male Animals in the Breeding of Cattle and Sheep, by the Right Hon. Earl SPENCER, *President of the Society. Read, February* 20th, 1839.

More from wishing to set an example to others, than from any hope that what I myself can suggest will be practically useful, I submit to the English Agricultural Society the results of my experience in an important part of that division of farming, to which my own attention has been particularly applied,—I mean the breeding of

stock. The part to which the following observations apply is the selection of male animals. A large proportion of farmers breed sheep and several breed cattle; to all who breed either this subject is one of great importance.

The object of a certain number, is to breed bulls or rams for the purpose of selling or letting them, but that of the majority is to breed oxen or wethers for the purpose of grazing. The first of these classes is very well aware of the importance of selecting good male animals, and profess to spare no trouble and to be very indifferent as to the expense which they incur in obtaining them; but with respect to those whose object it is only to breed oxen or wethers, I am afraid the case is generally very different, and they take very little trouble and expend as little money as possible in procuring the male animals to which they put their females; that is, they consider as a matter of indifference that on which the profitable or unprofitable nature of their occupation mainly depends.

It is admitted by every one that the bodily and constitutional qualities of the offspring are usually similar to those of the parents, either combining in various proportions the qualities of both parents, or taking entirely after one. I should say, as respects cattle and sheep, that, in most cases, the qualities of the male parent predominate in the offspring. I have also observed that the worse-bred the female is, the more will this be the case, when she is put to a well-bred male. This observation was first made, I believe, by the late Mr. Berry, in an essay, for which he received a prize from the Highland Society. He accounted for it thus: a well-bred animal means one whose ancestors for several successive generations have all been good, that is, have all possessed the peculiarities in constitution and shape which it is the object of experienced graziers to obtain in their stock. The characteristic, therefore, of the family of such animal will be such peculiarities; but the ancestors of a badly-bred animal will probably have varied in every possible way, and therefore there will be no distinguished characteristic in its family; it is consequently most probable that the offspring produced from a cross between two animals so circumstanced will be more like the one in whose family there is a distinguishing characteristic, than the one in whose family no such

characteristic exists. The common but, I believe, mistaken notion, that the offspring from the first cross is better than that from any subsequent one, probably arises from the improvement in the first instance being so much more apparent than, for the reason given above, it is likely to be in any one generation afterwards. Now it is known to all graziers that the attempt to fatten an animal, who possesses no feeding propensities, produces loss instead of profit. If the above observations are correct, the feeding propensities descend from the sire; it is quite just, therefore, to say that a breeder of cattle or sheep, who considers it a matter of indifference what sort of male animal he uses, does consider it a matter of indifference whether he gains profit or incurs loss.

The first object which any breeder of cattle or sheep must keep in view, whether he intends to breed bulls or rams, or whether his aim is merely to breed oxen or wethers, is that the stock which he breeds shall be healthy. The first thing, therefore, to be considered in the selection of a male animal are the indications by which it may be possible to form a judgment as to his constitution. In all animals a wide chest indicates strength of constitution, and there can be no doubt that this is the point of shape to which it is most material for any breeder to look in the selection either of a bull or a ram. In order to ascertain that the chest of these animals is wide, it is not sufficient to observe that they have wide bosoms, but the width which is perceived by looking at them in the front should be continued along the brisket, which ought to shew great fulness in the part which is just under the elbows; it is also necessary that they should be what is called thick through the heart. Another indication of a good constitution is, that a male animal should have a masculine appearance; with this view a certain degree of coarseness is by no means objectionable, but this coarseness should not be such as would be likely to show itself in a castrated animal, because it thus might happen that the oxen or wethers produced from such a sire would be coarse also, which in them would be a fault. Another point to be attended to, not merely as an indication of a good constitution but as a merit in itself, is that an animal should exhibit great muscular power, or rather that his muscles should be large. This is an an usual accompaniment of strength of constitution, but it also

shows that there will be a good proportionate mixture of lean and fat in the meat produced from the animal; the muscles being that part which in meat is lean. A thick neck is in both bulls and rams a proof of the muscles being large, and there can hardly be a greater fault in the shape of a male animal, of either sort, than his having a thin neck. I am inclined to say, that in the new Leicester breed of sheep, which is the breed to which I am accustomed, a ram's neck cannot be too thick. Other indications of muscle are more difficult to observe in sheep than in cattle. In a bull there ought to be a full muscle on each side of the backbone, just behind the top of the shoulder-blades; he ought also to have the muscles on the outside of the thigh full, and extending down nearly to the hough. It will seldom happen that a bull having these indications will be found deficient in muscle. With respect to rams, my own observation does not enable me to point out any other indications of muscle except the thickness of the neck, which I have mentioned above; if other farmers are able to point out any, I would only say there is scarcely any thing to which they ought to pay greater attention.

As I am writing for the use of farmers, it is quite unnecessary for me to attempt to give a description of what is considered a well-shaped bull or ram; it is also obviously impossible to express in words what is meant by good handling. It is sufficient to say, therefore, that no male animal is fit to be used at all as a sire whose handling is not good, and that the more perfect his shape is the better. The above observations apply to breeding generally; for, whatever may be the sort or size of the animal intended to be produced, there is no doubt but that good health, propensity to fatten, and good shape, in all cases, ought to be aimed at. But there are not only different breeds, both of cattle and sheep, but experienced and very good farmers differ very much in opinion as to which peculiarities of shape and size are to be preferred, even among animals of the same breed. It is therefore very desirable, before any man commences to breed either cattle or sheep, that he should make up his mind as to the shape and qualities he wishes to obtain, and steadily pursue this object; if he does so, there is very little doubt but that he will succeed in having a herd of cattle or a flock of sheep possessing the characteristics which he at first intended they should

possess; but if, on the other hand, he breeds at one time with the view of obtaining animals possessing one sort of shape, and at another time with the view of obtaining animals possessing a different sort of shape, the probability is, that his stock will possess neither the one nor the other in any degree of perfection. Having made this decision, he should take care that the individual male animal which he uses shall possess the qualities which he requires. In addition to this, it is of great importance that these qualities should have been characteristic of the family from which the animal is descended; and if he is old enough to have been the sire of any number of offspring, it is of a great deal more importance still that they should possess them. Because all the perfections of shape and quality which the best judge may wish to find in a male animal are, after all, only indications of what the stock got by him will probably be: the seeing, therefore, what they really are is much more satisfactory.

There are few breeders, of cattle more especially, who breed upon so large a scale as to enable them to keep many male animals at the same time in use. A man, therefore, can usually only look at the general qualities of the females which he possesses, and observe what are the faults most prevalent among them: these he should be particularly careful to avoid in the male which he intends to use. It is sometimes said that a male animal ought to have no faults, and undoubtedly it would be very desirable that this should be the case; but, unfortunately, no such animal exists. All a man can do, therefore, is to avoid putting a male and female together whose imperfections are the same, so as not to increase the fault already existing in his stock. If a man breeds upon a large scale, and uses several males at the same time, he can, of course, attend to this more effectually than if he uses only one. In this case, he should select and put together the males and females individually, so as to endeavour to correct any imperfections which either of them shew. Most breeders of sheep, indeed, do use more than one ram, and all who pretend to take any pains in improving their flock divide their ewes, so as to put them with the ram who will most probably effect this object. I need not say that those (some of whom, I am sorry to say, still exist) who turn two or three rams of different shapes and qualities into a field with all their ewes, without attempting to make any

selection among them, have no right to expect to be successful breeders; and if they do expect it, will certainly be disappointed. I believe the general opinion of breeders is, that it is disadvantageous to endeavour to correct any fault in the shape of a female by putting a male to her who possesses, in extraordinary perfection, the merit in which she is deficient, but who in some other part of his shape is faulty. My experience leads me to say that this mode of endeavouring to correct a fault is frequently successful. It would be better that none of the females from which a man intends to breed should be faulty in shape to any considerable degree, but it almost always will happen that some animals, possessing an excellent constitution, good blood, and a great propensity to fatten, and therefore such as the owner would very unwillingly cull, will fail decidedly in some part of their shape. I would say that, when this is the case, it is worth while to try the experiment of putting to them a male remarkable for his perfection in this failing part; and, in my opinion, such a male will be more likely to correct the fault, than one who shows no one part of his shape very superior to the rest. The late Mr. Chine, whose eminence as a surgeon is very well known, published a tract upon the breeding of domestic animals, which contained, as might be expected, most valuable information. His suggestions are such as ought to be very carefully attended to; but it is probable that his meaning has been mistaken in one recommendation which he gives, namely, that in which he is understood to say that it is always desirable that the male should be smaller than the female. When he makes this observation he is speaking of the crossing of different breeds, and probably only means that in a cross between a large breed and a small one, the male should be taken from the small breed, and the female from the large one. It is hardly possible that he intended to say that in the same breed the male ought to be smaller than the female, because this is contrary to the practice of nature. In every description of land animal with which I am acquainted the males are of a larger* size than the females. The attempt also to follow this advice would undoubtedly, in a few generations, so very much reduce the size both of males and females, as considerably to diminish their value. I can say, from my own experience, that some of the best-shaped animals which I have bred

have been produced by following a contrary course. I prefer breeding from large females; but if I do breed from one which I think too small, I put to her the largest male of good shape that I possess. As one instance among several to prove that this course may be successful, the ox which I showed in the fourth class, at the last Smithfield show, and which obtained the prize in that class, was by the largest bull I have, from a cow so small, that I culled her after she had bred that one calf. It must be admitted that the theoretical reasoning which Mr. Chine adduces in support of this recommendation appears to be very conclusive; but, even in the restricted sense in which I understand it, there is some doubt whether it is practically correct. The most successful cross between two different breeds of cattle, of which I am aware, was the one between a Durham bull and a Galloway Scotch cow, made by Mr. Charles Colling. The produce from this cross sold for enormous prices at his sale, and at the present day a majority of the best short-horned cattle are descended from it. My opinion, then, the result of my own practical experience, is, that if a man considers the female animals which he possesses to be smaller than he wishes, he may safely put them to a male of large size, provided he is well-bred, of good quality, and is well-shaped. But I am bound to add, that I know, in giving this opinion, I differ from the most skilful and successful breeders with whom I am acquainted.

It follows from the above observations, if they are correct, that the first and most indispensable object which all breeders must try to obtain, whatever may be the sort of animals they wish to have, whatever may be the shape or size they prefer, is that the male animal which they select shall possess a strong and healthy constitution. This is absolutely essential; but it is almost conducive to their success that they shall, after due consideration, make up their minds as to the qualities which they wish their stock to possess; that, having made this decision, they shall steadily pursue the object they have in view, and endeavour to select such males as shall be likely to get offspring possessing these qualities; that they shall carefully and candidly examine the females from which they intend to breed, observe the faults in shape or quality which prevail among them, and select males who shall possess corresponding perfections.

That the safest mode of ascertaining what are likely to be the qualities of the produce from a male in future is, where there is the opportunity, to see what are the qualities of the offspring already produced from them; then, the next to this is, to observe what are the qualities of the family to which he belongs; and that in the case of not having the opportunity of making use of either of these guides, they may assume that it is probable that the qualities of the individual himself, which in all cases ought to be attended to, will, if he is well-bred, descend to his offspring.

It has already been said that there are two classes among the farmers who breed cattle and sheep; the one, of those who breed bulls or rams, and the other, of those who breed oxen or wethers for the purpose of grazing only: the above observations are intended to apply to both. But much more attention ought to be paid by the first of these classes to the selection of the animals from which they breed than is absolutely necessary in the other. This is essential to their own interest, because a male animal very often shows faults in his shape, which, if he had been castrated, would not have appeared. It frequently, therefore, happens that the produce from a bull or a ram may prove excellent cattle or sheep for grazing purposes only, but may be totally unfit to be kept as the sires of future stock. Their duty, also, to those who hire or buy from them imposes upon them the obligation to pay the strictest and most minute attention to the qualities of their male animals; more particularly, they are bound not to offer to their customers any one, of the health of which they have any reason whatever to doubt, whether this doubt arises from any weakness of constitution, which may have appeared in the individual himself, or whether it arises from their knowledge of the family from which he is descended. They are bound, also, not to keep as males any animals who are not perfectly well-bred. It does not follow from this, that a long pedigree is in all cases necessary, although it is generally desirable; but it sometimes happens that a female, of whose pedigree the owner is ignorant, will have produced offspring which have all possessed extraordinary merit, and which have proved themselves good breeders also: a male descended from such a female may be considered perfectly well-bred on her side;

and will, very possibly, prove a better sire than many whose pedigree on paper is much longer.

In paying this minute attention to their occupation, the breeders of male animals have some advantages not possessed by others; they have generally the opportunity of knowing accurately what are the characteristics of the families of the animals from which they breed, an opportunity not possessed by those who breed only for grazing purposes. In order to make a proper use of this advantage, they ought to keep accurate pedigrees of their cattle and of their sheep, and as far as possible, when they put the males and females together, recollect what have been the respective qualities of the ancestors of each. They have also the opportunity, by using a male cautiously at an early age, of knowing, by experiment, whether the stock produced from him is good or bad, before they run the risk of injuring their stock materially by using him largely. This may be ascertained with sufficient accuracy, when the produce are very young; for an experienced breeder can judge with tolerable certainty what will be the shape of a calf or a lamb when it grows up by seeing it soon after it is born, and before it has begun to lay on fat. Nor is it necessary to see many of the produce for the purpose of deciding what its general characteristics will probably be. I admit that in saying this I am speaking more from my experience as a breeder of cattle, than a breeder of sheep, but I beleive the same observations will apply to both. It is certain, however, that seeing four or five calves from a bull ought to be a sufficient guide to the breeder as to whether he will be valuable as a sire or not. Unless there is a family likeness which generally pervades through the produce from a bull, although he may be valuable as the sire of oxen, it will not be safe to use him as the sire of bulls. The seeing, therefore, four or five calves will prove to the breeder whether there is such a family likeness among them, and whether it exhibits itself in such qualities as indicate that when they grow up they will be valuable animals.

There is one failing to which all breeders are liable, but to which the breeder of male animals, from the greater interest attached to his occupation, is more peculiarly liable, and against which he ought

most carefully to guard himself; this is, too great a partiality for animals bred by himself. In order to guard against this, he ought to occupy himself more in looking for faults than in discovering merits in his stock, he ought to listen to every criticism he hears made upon them, even by those whose judgment he does not hold in high estimation—not, of course, with the view of being satisfied at once that the criticism is correct, but with the view of satisfying himself, by accurate and candid examination, whether it is so or not; and he ought frequently to see the stock belonging to other breeders, and fairly compare its merits with those of his own.

I think it most probable that in the foregoing observations nothing will be found which will give new and useful information to practical farmers; but I have been induced to submit them to the English Agricultural Society, because I conceive that one of the great objects of that society is the diffusion of knowledge connected with every branch of farming. The best way in which it can be enabled to effect this object, is by those of its members who have paid attention to any of the divisions of farmiug operations communicating to the Society the results of their practice and experience. It will then be for the Society to circulate, by any means in their power, such of these communications as it shall appear to them are likely to be useful to those engaged in the cultivation of the land. With this view I place this paper at their disposal.—*Journal of the English Agricultural Society, vol.* I., *part* 1, 1839.

On the transmission of Fruit-Trees, &c. to foreign countries.

Your readers are aware that the transmission of seeds to and from India is now regularly carried on through the India-House,—such as are suitable to the different climates and seasons of that extensive empire are sent thence by every mail; and in return, from the East India Company's Botanic Gardens, are received Pines and various other plants suited to the climate of this country. The success has been so complete, that the Deodar may be mentioned as an instance of a rare plant now become common in every part of the country. As the time employed in the transit is so short, no particular precaution would seem to be required; but as the dawk, or mail, is con-

veyed in India by men, the letter-bags are often exposed to wet, either from rain or in crossing rivers. Hence it is necessary to cover the parcels of seeds with a substance like India-rubber cloth, which is impenetrable to wet, since this has, upon the whole, answered remarkably well; but care must be taken that the seeds or fruits are not in a moist state when covered up, otherwise they are apt to become mouldy and to lose their vegetative power. As it was desirable to attempt the transmission of cuttings, as well as of seeds, several endeavours have been made to effect this object. Here the difficulties were greater, because we have not only to exclude external damp, but to prevent the natural moisture of the cuttings from evaporating when exposed to the great heats of an India sun.

The first attempt was made by Dr. Lindley, at the request of Lord Auckland; when he adopted the plan of enveloping the cuttings of fruit-trees in the India-rubber cloth. Some of these, on their arrival in India, showed symptoms of life; but none vegetated when placed in the ground. The next year a second attempt was made; but, owing to a mistake, the success was not so great as during the first. The cuttings, when sent from the Horticultural Society, seemed so nicely packed that I did not think it desirable to open them out, but enveloped them in the water-proof cloth, not knowing till afterwards that this had already been done, and that the parcel was *much* more protected than was necessary. A third attempt was therefore made last winter, in which care was taken not to include too much moisture, by partially drying the cuttings, and by interposing a good non-conductor (cotton), which would prevent the cuttings from drying up, by excluding the influence, as much as possible, of external heat, while the ends were dipped in sealing-wax, as the only substance at hand when the packet was making up, and the whole enveloped in a layer of India-rubber cloth. Some were sent in large, others in small packets, so as to travel by the letter dawk, part of them being loosely, and part closely packed. The results of this experiment are given in the following very interesting communications from Drs. Gibson and Falconer; the former in the Bombay Presidency near Poona, and the latter at Saharunpoor, a much more distant station :—

The letter from Dr. Gibson is dated Colabar, 25th Jan., 1842, and runs thus :—" I write to let you know the fate of the cuttings brought

by the two last despatches. Those first sent appeared to have suffered much; and I had no hope of any of them when I put them into the ground; those last sent arrived in much better order. In the majority of these the wood was green. I put them in pots under charge of the collector. I will hereafter send for them to place them in the hills."—In another letter, dated 27th April, 1842, Dr. Gibson says—"Almost all the cuttings of the Jargonelle Pear, &c. &c., received by the mail, which arrived in January, have rooted, and till the beginning of the hot season were flourishing. Since then they have drooped much, and I fear they will die."

The following is Dr. Falconer's letter, from Saharunpoor, Feb. 16, 1842, upon the same subject:—"A signal triumph over the difficulties presented by distance and climate in transferring the living vegetable productions of one remote country to another has lately been effected between England and India, by means of the overland route. Most of the readers of the *Gardeners' Chronicle* are aware of the great success which the last three years has attended the introduction of Himalayan seeds into England. The Deodar Cedar, Cupressus torulosa, Pinus Gerardiana, &c., which formerly used to cost from one to three guineas a plant, now ought to be had from nurserymen (some of them at least) at nearly the same price per score; and the supplies sent from India are now on such a large scale that in course of a few years they will probably be the most common acclimated Coniferæ in the country. This result has followed the establishment of the overland communication between England and India.

"Everything which it was desirable to effect in the transmission of the productions of India *to* England was accomplished to the fullest extent. But the same amount of success was not realised in the despatches *from* England *to* India. Seeds and bulbs of every description were received in excellent order: but failure had followed on almost every attempt to introduce the fine sorts of European fruit-trees into the temperate parts of India. If sent in Ward's cases, a considerable portion of them will reach Calcutta alive by sea; but the voyage up the river to Saharunpoor, at the foot of the Himalayahs, is certain destruction to them. The voyage occupies from two to

five months, at the least. The same result invariably followed on numerous occasions.

"It thence became a matter of much interest and importance to determine whether cuttings and slips of fruit-trees might not be sent out from England by the overland mail; for although good sorts might in the long run be expected to be raised from seeds, the limited number of cultivators in India, and the small number of stations in the temperate parts, where the trial might be attempted, made it of consequence to effect that end by some speedier method. In the winter of 1838-39 a despatch, from the London Horticltural Society, of slips for grafts, consisting of Apples, Pears, Cherries, Gooseberries, &c., was sent out to Lord Auckland in India, by the overland mail; but not one of them reached alive. A similar trial was made in the winter of 1839-40, by a despatch from the India-house to the Botanic Garden, Saharunpoor. The package was made air-tight by means of numerous envelopes of India-rubber silk, and the slips were tied up in small bundles carefully rolled in moss. Their ends being left uncovered at the wounds, they all arrived dead, apparently through mildew and sphacelation. The moss was moist, and exhaled a yeasty odour, as if partially fermented. They were about three months between the India-house and Saharunpoor. The failure in this case appeared to have arisen from an excess of moisture; the slips had come, in fact, in a sort of vapour-bath,—and it was recommended to Dr. Royle to try a more open kind of package, to do the ends of the slips over with pitch, and to use perfectly dry moss.

"A third trial was made by a despatch fron the India-house on the 30th Oct., which arrived at Saharunpoor on the 18th Jan., being 80 days. These cuttings were loosely packed, the ends of them being done over with sealing-wax, and the bundles rolled up, some of them in dry moss and some of them in cotton. They were all found on their arrival to be dry, crisp, and withered; the failure on this occasion appearing to have been caused by desiccation in consequence of the too free access of air. A fourth trial was made in a despatch of three small packets from the India-house on the 30th Nov., which reached the Botanic Garden at Saharunpoor on the 27th Jan. last, having been 58 days on the journey. The cuttings in this instance were packed in duplicate, in two different ways. All

of them were rolled up in cotton, and done over with sealing-wax at the ends; but one packet was wrapped up in an envelope of India-rubber cloth, so as to be nearly, if not completely, air and water tight,—the other had only two loose covers of paper, so as to be freely permeable to air. In the first, or India-rubber packet, there were 12 slips, 7 of which were Apples and Pears, and 5 stone fruits, viz,, Cherries and Plums. The latter were all found to be dead, the pith dry and brown-coloured, and the green colour of the liber gone. The 7 Apple and Pear cuttings were all in a more or less vigorous state; the pith moist and green, and the bark, although shrivelled, green and lively. The slips from yearling shoots were much weaker than the older ones; and the Pear slips were observed to be stronger than those of the Apple. In the second packet, with the paper wrappers, the slips were all dead, and appeared to have been so for some time. The contents of the third packet were confined to Hop-roots, put up in paper only; these were dead also. The live cuttings were immediately put in the ground; and there is every prospect at present of the development of the buds, and of roots being thrown out. The most promising among them are a Jargonelle Pear slip and Malo de Carlo Apple.

"The result is of no ordinary interest: Bombay being about 6,100 miles (viâ the Red Sea, Suez, Alexandria, and Malta) distant from Falmouth, and Saharunpoor about 900 miles from Bombay, the cuttings in question travelled all this distance, closed up for 58 days; they underwent two sea voyages, subject to considerable vicissitudes of temperature, and two land journeys, the latter of which, across the continent of India, was 900 miles, tumbled about with letters in a mail-bag carried by a runner. Yet with all these drawbacks, they reached their destination with a fair moiety of them alive. So much for the advantages of the steam communication between England and India, as affecting gardening matters. With the benefit of experience, greater success may be expected to attend future trials. The Stove plants and the Ribes tribe have hitherto been failures. Nurserymen in England may find their advantage in resorting to the plan with others of the colonies; and by extending it to suitable ligneous plants, besides fruit-trees, they may be able to introduce from abroad valuable and interesting species at a

cheap rate. The plan has proved to be efficient for a distance of 7,000 miles, if travelled in less than two months.

" The method which the experience above referred to would suggest as the best, is this:—let the slips be cut early in winter—say in November—selecting oldish, firm twigs, with the greatest number of buds; roll them up separately in cotton, after paying over the wounds at the ends with cobbler's-wax, or some similar composition,—sealing-wax one would imagine must be injurious by scorching the ends, and thereby destroying the vitality of the terminal portions of the slips. Then make them up into bundles of from 6 to 10 each, and wrap these bundles separately in cotton, coiled round them with moderate firmness; 20 to 40 slips are enough for one packet. Put a wrapper or two of paper around the whole, and finish with an envelope of stout silk, or even cloth, freely spread over on the inside with India-rubber, in the liquid or adhesive state, so that the side and end folds may stick in close apposition, making the whole air and water tight."

A subsequent letter from Dr. Falconer, dated April 16, 1842, states that " Capt. Nesbitt, of the Windsor, brought out two of Ward's cases, filled with young fruit-trees. For the first time, they reached Saharunpoor in beautiful order: 11 plants being alive, consisting of Apricots, Peaches, a Nectarine, Apples, and a Black-currant bush. Most of these were in a vigorous state. There were Gooseberries, Red-currants, Raspberries, &c., in the case; but these were all dead."*

In the proceedings of the Agricultural and Horticultural Soiety of India, it is stated that Baron Von Ludwig had a box containing 1,200 young plants despatched to him from Germany, which were five months in the box. Of these not more than two dozen failed to vegetate. The following method of packing was in this instance adopted:—" The plants are taken out of the ground in the depth of winter, when the *stems* are bare of leaves and all the *sap* has descended to the roots. The earth is carefully shaken from the roots, which are then immersed in a thin compost four or five times, till they are

* These fruit trees were presented, in the first instance, by Captain Nesbitt to the Agricultural Society of India, and transmitted, by the Society, to Saharunpore. See proceedings of the Society for February and May 1842.—ED.

completely coated over to the thickness of 1-8th to 1-10th of an inch, and allowed to dry perfectly, when they are placed in a strong box prepared for the purpose, on a layer of dry straw. As soon as one layer of plants is completed, a layer of dry straw is placed over it, and so on till the box is completely filled, and well pressed down; the lid is put on, the seams well *pitched*, and the case made as air-tight as possible."

By puddling with clay, or according to the foregoing method practised in the transmission of living trees, &c., to the Cape of Good Hope, by a better selection of cuttings, and by improvements in the method of packing, complete success will no doubt be attained. —*J. F. R.*—*Gardeners' Chronicle for August*, 1842.

On the Thrashing Machine, with reference to the construction of those employed in East Lothian. By Mr. ROBERT BRIDGES, *North Berwick.*

[The following article is a condensed form of the essay by Mr. Bridges, offered in competition for the premium for the best essay on the Thrashing Machine. Though the article does not comprehend all that the Society expected, yet as it contains much practical information on the subject, obtained, it is believed, from extensive employment in one of the first agricultural districts of the country, it is conceived that its publication may confer benefit on country mill-wrights.]

I. OF THE DIFFERENT MOVING POWERS.

1. *Water-Power.*—The expense of a substantial water-wheel, including mason-work of fall or mill-race, varies from L. 70 to L. 100: the average may be taken at L. 90. The forming the water-course and tail-race seldom exceeds the cost of making a large open drain of the same length; but, in many cases, there is the additional expense of forming a reservoir, for collecting and preserving the water, which, with the water-course and tail-race, may occupy a space equal to two acres of ground. The repairs of a water-wheel are trifling, and it requires almost no superintendence while working. If the supply

of water is abundant, it is available at all times, without interrupting other labour. Water, in short, may be held as the best of all moving powers; and is, under almost any attainable circumstances, the most economical.

2. *Wind-power.*—The cost of erecting a wind-mill, of the best materials and construction, including tower, may be fairly estimated at L.350, exclusive of the carriage of building materials. Its annual tear and wear, from constant exposure, is very great, and this, whether working or not. It requires the constant attendance of a person, to watch and regulate its motions. As a power, it is variable and inconstant, not available for working above one-half of the year, or, at most, two-thirds. It follows, therefore, that to command the service of the thrashing-machine at all times, the farmer must also have a horse-mill or steam-engine attached to it. It is, on the whole, more than probable, that another wind-mill will never be erected in Scotland, for farming purposes.

3. *Horse-power.*—The expense of a horse-wheel, including the building to cover it, cannot be reckoned at less than L. 120. It is difficult to estimate the annual expense of a horse-mill; but, on a farm extending to 250 or 300 acres, it occasions the keeping of a pair of horses more than would otherwise be necessary, for labouring the farm, if steam or water power were employed for the thrashing mill.

The expense incurred by a pair of farm horses, has been variously estimated by eminent agriculturists, who have turned their attention to the subject. Mr. Middleton of Middlesex estimates the expense of food, harness, shoeing, farriery, interest on purchase, decline in value, and insurance, at L. 157, 10s. per annum; Mr. Brown of Markle, at L.135, 1s.; Mr. Kerr of Berwick, at L. 120; General Report of Scotland, at L.94 : 14 : 6; West Lothian Report, at L.90; Dumbarton Report, at L.80. The average of these various estimates is L.112 : 17 : 7, which may be assumed as the average expense incurred keeping an additional pair of horses. To this is to be added, the expense of other two pairs of horses for every day the mill is employed; and being the severest labour to which farm-horses are ever applied, it not only wears them out faster, but, from overheating, occasions many diseases. Add to this, that while the horses are

engaged at the thrashing machine, field-labour, however urgent, must, for the time, be suspended. In short, none but a skilful agriculturist, who enters into the most minute calculations, can fully estimate the expense of a horse-mill.

4. *Steam-power.*—Under this head, the first point requiring consideration, is the power of the engine necessary to work the thrashing machine. Experience has shewn, that, with a properly constructed thrashing machine, a four-horse power steam-engine, on the high-pressure principle, is capable of doing as much work as can be done with a six-horse engine, applied to one of inferior construction. And hence it may be inferred, that, for farm purposes, a four-horse engine may be held as a sufficient power. Assuming, then, that an engine of four-horse power is sufficient to work the thrashing mill, the expense will be, engine L.110 ; engine-house and chimney-stalk about L.70 ; making a well from L.5 to L.7. The engine requires the attendance of a handy person, who may also act as fireman. The cost of repairs does not much exceed that of the horse-mill. The only other item is the cost of fuel. If chew-coal or culm can be obtained, its price, exclusive of carriage, may be taken at 3s. 6d. per ton ; and ten cwt. will be the consumpt per day of ten hours. Steam-power is available at all times, without interrupting field-labour, and, as already stated, saves the expense of a pair of horses.*

The comparative estimate of the annual expense of the several moving powers, founded on the foregoing statements, and on the supposition, that there are 42 days' thrashing yearly, is, of

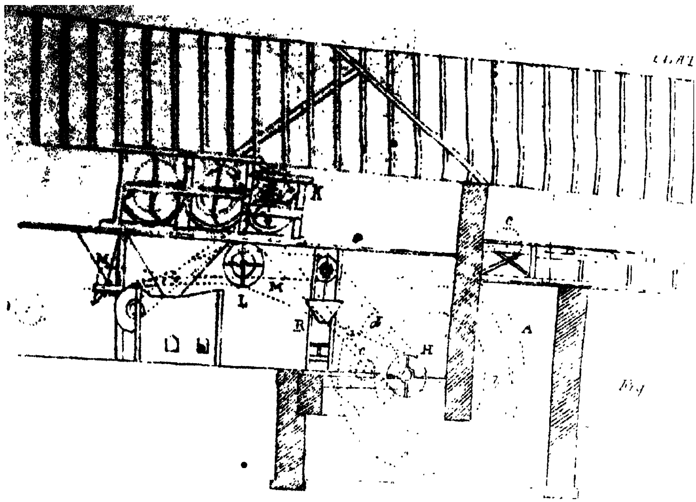
Water.—	Cost of water-wheel and mill-race,	L.90 0 0
	Reservoir, water-course, and tail-race say....................	150 0 0
		L.240 0 0

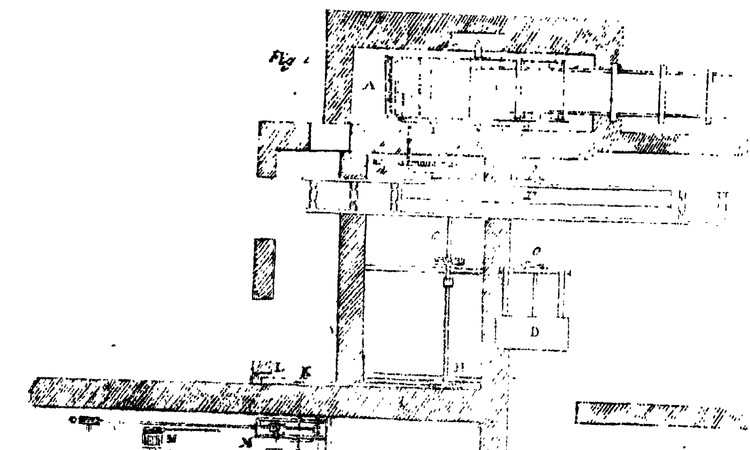
* In estimating the expense of steam-power, it is probable the author has taken too low a standard. A four-horse power engine may, and has, no doubt, often been found adequate to the task of thrashing; but the practice is now become so general, for farmers to have other operations than thrashing performed by power, that we would recommend a six-horse power in preference. The difference in first cost will not exceed L.20; with ten per cent. on that of fuel.—EDIT.

10 per cent on outlay,...............		L.24	0	0
Value of two acres of land,............		6	0	0
Yearly expense,..		L.30	0	0
Wind.—Cost of wind-mill and tower,....	L.350 0 0			
10 per cent. on outlay,...		L.35	0	0
Attendance of a man 42 days at 2s... ..		4	4	0
Yearly expense,.... ..		L.39	4	0
Horse.—Cost of horse-mill,....	L.120 0 0			
10 per cent. on outlay,..		L.12	0	0
Expense of extra pair of horses......		112	17	7
Decline of value on the other two pairs,..		6	0	0
Yearly expense,..		L.130	17	7
Steam.—High pressure steam-engine, of four horse power.... ..	L.110 0 0			
Engine-house and chimney..	70 0 0			
Well,....	7 0 0			
	L.187 0 0			
10 per cent. on outlay,..		L.18	14	0
21 tons of chews and culm, 3s. 6d		3	13	6
Carriage of do......... .... 7s. 0d		7	7	0
42 days of man attending at 2s.......		4	4	0
Yearly expense,..		L.33	18	6

In the preceding estimate, nothing is allowed for repairs. The annual repairs necessary on a water-wheel are trifling, and the repairs on the other will be found not to differ so much, as to give the one any great preponderance in this respect.

From the foregoing statements, and comparative estimate of annual expense of the several moving powers, it is evident, that water,





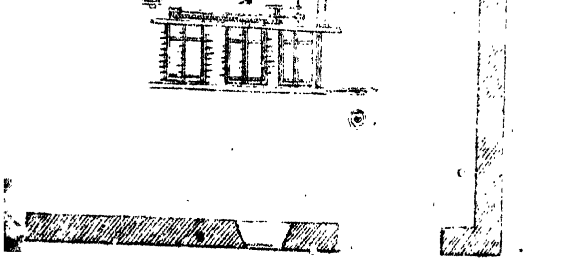
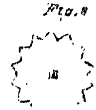


Fig. 7



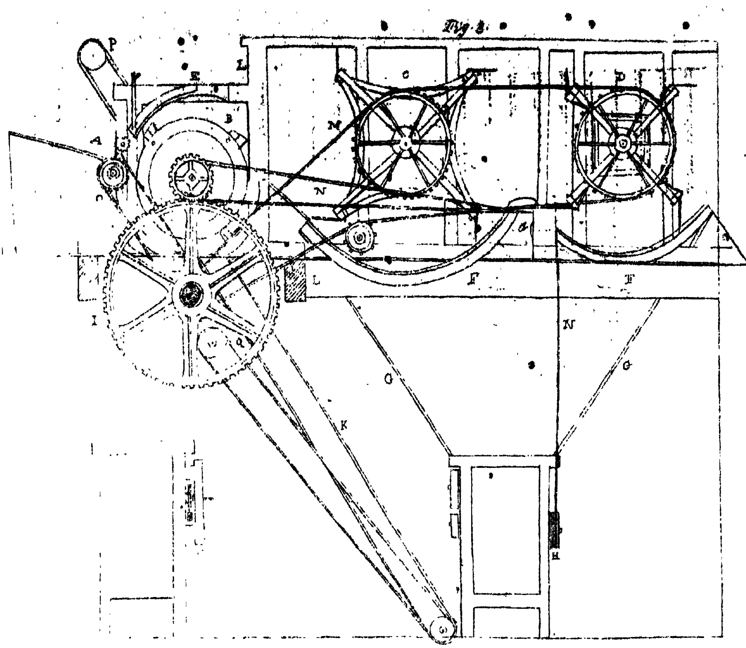


Fig. 3.

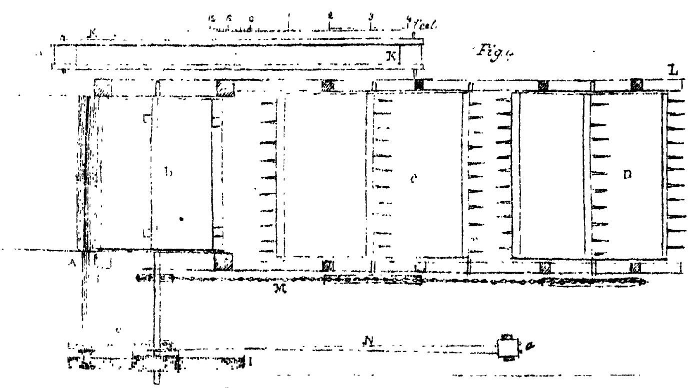


Fig. 4.

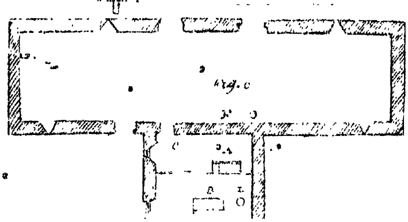


Fig. 6.

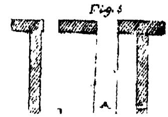


Fig. 5.

when it can be obtained is the cheapest moving power that can be applied to the thrashing machine; and the advantage in point of economy is so obvious as to warrant the outlay of a much greater sum than that specified in the comparative estimate. It is equally obvious, that, next to water-power, steam is the cheapest and most economical; and, in absence of a sufficient supply of water, nothing but the total want or hight price of fuel can prevent its universa adoption.

II. OF THE APPLICATION OF THE MOVING POWERS.

1. *Steam-power.*—The modes of connection between a steam-power and the thrashing machine, are by spur-gearing or by belts. The adoption of the one or the other must be determined by local circumstances; but, wherever practicable, a belt is the best mode of connection.

2. *Horse-power.*—The usual diameter of the horse-walk is 25 feet. The best speed for the horses is their ordinary pace, equal to $2\frac{1}{2}$ rounds of a horse-walk of 25 feet diameter, per minute, or about the rate of two miles per hour. When a spur horse-wheel is employed, the diameter is 28 feet; and when a face-wheel, the diameter is 18 feet. The face-wheel seems preferable, being not only easier for the horses, but admits of the least complicated and most advantageous mode of connection with the thrashing machine. Thus, with a face-wheel, the mode of connection is by a horizontal lying shaft, with a large spur-wheel inside driving the drum-pinion, while the rollers and rakes, by means of a pitched chain, receive their motion from this lying shaft, without the intervention of other shafts and wheels.

III. OF THE THRASHING MACHINE.

1. *General arrangement of the parts of the thrashing machine in the barn.*

(1.) *Position.*—The arrangement of the parts of the thrashing machine are represented in Plate III., Figs. 3 and 4; Fig. 3 being an elevation, and Fig. 4 a plan of the machinery—the same letters referring to the corresponding parts in both figures. AA represent the position and arrangement of the feeding rollers, B the drum, C the first rake, D the second rake, E the apron, FF the screen, GG the hopper, HH the first and second fanners, I the connecting spur-

wheel, K the elevators, LL, &c. the framing of the mill, M the rake-chain, NN the fanner-rope, O the roller-chain, P the upper pulley, for elevators of *shorts*, Q the upper pulley for elevators of second fanners and hummellers.

The author considers the best position for the thrashing machine in the barn, to be that represented in Figs. 5 and 6, Fig. 5 being a portion of the upper barn, where A is the position of the mill in the loft, while Fig. 6 is the ground floor of the corn and straw barns, A representing the position of the first fanners, B the second fanners, C the chaff-hole, D a hummeller, E the corn-barn, and F the straw-barn. The dimensions for a six horse mill of the former are 40 feet by 20 feet and 9 feet high, and the latter 70 feet by 20 feet, and about 14 feet high.

The most general method of conveying the corn from the stack-yard to the upper mill-barn, is by single horse carts, one filling at the stack while the other is emptying at the barn. But when the elevation of the stackyard is equal to, or greater than, that of the floor of the upper barn, barrows are generally used for bringing the corn from the stackyard. Three barrows will be found sufficient to convey the corn to the mill as fast as it can be thrashed, at about two-thirds the expense of carting.

(2.) *The Drum.*—The drum is the most important part of the thrashing machine. In giving it motion a very great portion of the moving power is expended. It being the standard for the dimensions, and velocity of the other parts of the machine, its construction and velocity are of much importance. To thrash clean, the drum requires to move with a velocity of 320 revolutions per minute, where its diameter is 39 inches, this diameter being, after numerous experiments, considered the most effective. The length of the drum, that has been in like manner determined from a train of experiments, is 3 feet 6 inches, for a machine of six-horse power.

From the velocity at which the drum moves, and the force with which the beaters strike the straw, it requires to be made of materials at once light and durable. These consist of an axle of malleable iron, with arms of the best hard wood, fixed in malleable iron flanges. The best covering for the drum is sheet iron, No. 24, being both clean and light.

The beaters are made of the best hardwood, 2 inches thick, and 3½ inches deep, faced with malleable iron, steeled, and ⅜ths of an inch thick on the striking edge.

To prevent the straw winding about the axle of the drum, the frame is exactly fitted to its length, so as not to have a void of more than one-half inch at each end of the drum. The beaters are made to strike upwards, as in this way the grain is much easier separated from the straw, the machine is more easily kept in motion, and less apt to get out of order.* From what has been said on the *diameter* of the drum, it is unnecessary to add that it should be the same for machines of all powers.

(3.) *Feeding Rollers.*—The feeding rollers are about one inch longer than the drum. They should have weight sufficient to prevent the beaters pulling the corn faster through than the rollers pass it, and should present the corn to the beaters as directly as possible. These objects are attained by solid cast-iron rollers of four inches diameter. Some corn from its nature, and others from its state, requiring a greater number of strokes to thrash it than others, the feeding rollers are fitted up so as to admit of two rates of velocity; one in which they make 1 revolution while the drum makes 5¾, another in which they make 1 while the drum makes 4. And these two velocities have been found sufficient for all cases. After repeated experiments, it has been fully ascertained that the best form of fluting for the feeding rollers is, for the upper one a concave flute, and for the under an angular flute, as represented by Figs. 7 and 8. The most approved gearing for working the feeding rollers is two pairs of spur-pinions, on parallel spindles with a sliding clutch between the pairs of driving pinions. This pair of pinions has each a round eye which admits of their revolving loose on the spindle, when not fixed by the clutch. By attaching the clutch to the one or the other of the driving pinions, the motion of the rollers is instantly changed from quick to slow, or *vice versa,* without stopping the machine. The sliding clutch is carried round with the shaft by means of a feather fixed in the shaft

* Many experienced mill-wrights hold a contrary opinion, and believe that the drum works more easily when striking downwards; we cannot see how any difference in effect can exist; and rather suppose that matters of convenience will generally determine the adoption of one or the other mode.—EDIT.

or spindle, and is shifted by means of a lever, the long end of which rests on a plate with three notches. To change the motion of the rollers, the end of the lever is moved from one extreme notch to the other extreme. To stop the rollers it is removed into the centre notch. In the case of straw winding round the rollers, it is now generally considered that stopping the rollers is preferable to reversing their motion. The writer has accordingly made no machine with gearing to reverse the motion of rollers, but has been requested to remove it from machines made by others, and attach the gearing for varying their motion and stopping them. The only means, so far as has yet been attempted, of reversing the motion of the rollers, when they have different speeds, is by applying two bevelled wheels (with a sliding clutch between them) to the same spindles as the pairs of spur-pinions and sliding clutch. These bevelled wheels are moved by a third bevelled wheel and spindle receiving motion from the main shaft.

The distance of the rollers from the beaters, like their velocity, depends very much on the state of the corn to be thrashed, but as a general rule five-eighths of an inch may be considered as the best distance. It is an improvement to have the distance variable, and various methods are used to effect this; one of the simplest is to have the block in which the rollers run, made separate from the thrashing machine, and afterwards fixed to the parts of the frame by strong bolts with a head on one end, a fixed collar between the block and the post, and a screw on the other and working in a nut sunk into the post. By turning the head of the bolts, the distance may be varied at pleasure. The under roller has its centre at least four inches above the level of the centre of the drum, and neither rises nor falls, but the gudgeons of the upper roller work in a perpendicular fork, whereby they are at liberty to rise or fall as the feed varies. The best coupling for the spindles or shafts of feeding rollers is an oblong box of malleable iron, welded to the end of one part of the shaft, and receiving that of the other part.

(4.) *The Apron.*—The apron of the drum is made in the form of an arc of a circle, whose diameter is about six inches greater than that of the drum. The lower end is placed five-eighths of an inch

from the rollers, and the upper about three inches and a half above the beaters?

(5.) *The Rakes.*—The best position of the rakes, in relation to the drum, is when their centre is placed ten inches above the centre of the drum, and the extreme points of the first rake ten inches from the beaters. The length of the rakes ought not to be less than six inches longer than the drum. The diameter of the first rake is six feet over the extreme points, and of the second five feet, and both make eighteen revolutions per minute. The simplest and most economical mode of communicating motion from the moving power to the first rake, and from that to the second, is by a pitch-chain, arranged as shewn in Fig. 3.

(6.) *The Fanners.*—The fans are three feet in diameter, and twenty-one inches broad; two hundred and thirteen revolutions per minute is the most effective velocity. The simplest method of communicating motion from the thrashing-machine to the fanners is by a rope from the drum passing over the leading pulleys *a*, and on to the pulley of the fan. For the shoe and riddle, the writer has substituted an endless web moving round two small rollers. It is placed underneath the hopper, and receives motion by a belt from the spindle of the fanner, and receiving the grain as it drops from the hopper, conveys it regularly forward till it falls before the fans. The endless web moves at nearly one-fourth of the velocity of the fans. While it is less expensive, and more easily kept in repair than the shoe and riddle, it also answers better, as it presents the grain more equally to the action of the fans. The method of working the second fanners is, in general, by a motion from the machine. But when a separate power can be obtained at no great expense, as may be easily done when water is the power employed, it would be advantageous to adopt it to drive both fanners, as the regularity of their motion, requisite for producing good work, would not then be interrupted by the irregularities of the machine.

(7.) *The Elevators.*—The most economical mode of raising the grain from the first to the second fanners is by elevators. The best for the purpose is an endless web formed into a continued series of square or oblong boxes, with a belt on each edge of the web, revolving on two pairs of parallel pulleys. The sides and bottoms of these boxes are

formed of the endless web, and their ends of wood. It is obvious that the length of the elevators depends on the height that the grain has to be raised; the width of the boxes are regulated by the mouth of the fanners' spout; and their depth is about 2½ inches. The velocity of the elevators is about 180 feet per minute. The motion is communicated by the upper pulleys. The elevators for the *shorts* are constructed on the same principle, and of the same materials, only larger.

(8.) *The Screen.*—The screen is made of cast-iron, hoop-iron, or of wood; the spaces between the spars are squares, whose sides measure an inch and a half. The spars, when of cast-iron, are five-sixteenths of an inch thick, and half an inch deep. There can be no doubt that the screen would be beneficially extended under the drum; but this could only be done in barns of greater elevation than they at present generally possess. The length and breadth of the top of the hopper is regulated by the length and breadth of the screen, and its height by the elevation of the barn. The sloping of its sides should not, however, be less than 50°.

(9.) *Fly-Wheel.*—From the experiments that have been made in regard to the application of the fly-wheel, its advantages have not been so obvious as to induce many owners of thrashing-machines to be at the expense of having it attached; and from what was stated in a former part of this paper under horse-power, a fly-wheel is unnecessary where a large inside spur-wheel is used, as it nearly serves the same purpose.

2. *Proportion of parts for a two, four, six, and eight horse power.*

The information necessary under this head will be best exhibited in a tabular form, as under:—

Dimensions of the lower Barn.

For a 2-horse power,	27 feet long,	16 feet broad, and	7½ feet high.
4	36	18	8½ ....
6	40	20	9 ....
8	44	21	9 ....

Of the Drum.

For a 2-horse power, 2 feet 6 inches long, and 180 revolutions per minute.

4	....	3 feet 0 inches	300	.. ....
6	....	3 feet 6 inches	320	.. ....
8	....	4 feet 0 inches	340	.. ....

Of the Feeding Rollers.

For a 2-horse power, 2 ft. 7 in. long, making 1 for 4½ or 6½ revolutions of the drum.

4	....	3 ft. 1 in.	.. ....	4¼ or 6	..
6	....	3 ft. 7 in.	. ....	4 or 5¾	..
8	...	3 ft. 1 in.	.. ....	3¾ or 5½	..

The diameter of the feeding rollers is the same for all powers.

Of the Apron.

The form of the apron is the same for all powers, its length being regulated by the length of the drum.

Of the Rakes.

The position of the rakes is the same for all powers; their length is regulated by the length of the drum. Their diameter are—

For a 2-horse power,	6 feet,	No second rake.
4	5	5 feet.
6	6	5 ....
8	6	6 .. .

But in all other respects the same for all powers.

Of the Fanners.

The diameter of the fans is the same for all powers. The breadth of the fans is,—

For a 2-horse power,	15 inches.
4	18 ....
6	21 ...
8 ...	24 ....

Of the Screen.

The form of screen is the same for all powers.

Quantity of work performed.

The average quantity of work that ought to be performed by these powers respectively is,

By a 2-horse power,	....	14 bush. wheat.	20 bush. barley and oats per hour.	
4	....	26	32	....
6	....	32	38	....
8	....	38	44	....

Number of attendants required.

The number of persons necessary to attend these machines without reckoning those employed in conveying the corn from the stack-yard are, when elevators are not used,

For a 2-horse power,	5 persons.
4	7 ....
6	9 ....
8	10 ....

IV. OF THRASHING-MACHINES OF SMALLER POWER.

The writer has never seen nor made any thrashing-machine under two-horse power. He lately, however, made one of two-horse power, and from the very great ease with which two horses work it, and the quantity of work it performs, viz. thrashing fourteen bushels of wheat and twenty of barley or oats per hour, he considers that it would be expedient and economical to make thrashing-machines of one-horse power: and if constructed with due attention to the proportions stated in this paper, a machine of one-horse power ought to thrash eight bushels of wheat and twelve of barley or oats per hour, while the cost of erection need not exceed L.30*. Though manual labour is the most expensive of all moving powers that can be applied to machinery, yet it may be well supposed that a man would be as economically and profitably employed in turning the handle of a small thrashing-machine as in wielding a flail. So convinced is the writer of the propriety of having thrashing-machines under two-horse power, that he intends, with all convenient speed, making one of one-horse power, and another to be wrought by one man, but forbears giving any opinion as to the limit of apparatus that ought to be attached, until the machines are fairly tested by experiment.—*Quarterly Journal of Agriculture, No. xlv., June* 1839.

* Thrashing-machines of one-horse power are well known in some of the pastoral districts of Scotland, as for instance the parish of Tweedsmuir, where they are successfully employed. In these machines the drum strikes downward; they have a screen but have neither shaker nor fan; they thrash from two to three bolls of oats per hour. Their price is about L.25.—EDIT.

"*A Practical Method of determining the quantity of real Indigo in the Indigo of Commerce.*" *By Dr.* Samuel L. Dana, *of Lowell, U.S.*

Dr. Dana directs that 10 grains of indigo, reduced to an impalpable powder, should be boiled in a Florence flask for a few minutes, in 2½ oz. of a solution of carbonate of soda, making 30° to 35° by Twaddel's hydrometer, then add 8 grains of crystals of muriate of tin, and boil for half an hour: a beautiful yellow solution of indigo will be obtained. Withdraw the flask from the lamp, and introduce into the solution 500 water-grain measures of a solution of 50 grains of bichromate of potash in 4000 grains of water. The indigo blue, with a trace of indigo red, will be precipitated, while the other components remain in solution. Filter the precipitate through a double weighed filter, washing the mass with 1 oz. of muriatic acid, diluted with 3 oz. of boiling water; wash with hot water till water only returns; separate, dry and weigh the filters; make a note of the weight of the precipitate; burn one filter against the other; the difference is the silica contained in the indigo, which, deducted from the weight of the precipitate, gives the quantity of pure indigo. Mr. W. Crum, who communicated the above, added, that carbonate of soda with protoxide of tin dissolves indigo, and forms a yellow solution, but so slowly, that he doubts if all the ten grains are acted upon. He thinks Dr. Dana must mean soda-ash, which contains a notable quantity of caustic soda; but a much weaker solution of caustic soda would answer the purpose.—*The Chemist vol. ii,* 1841.

*Action of Metallic Poisons on Vegetation.** *By* M. Louyet.

M. Louyet states in his memoir that having divided a garden into several squares or compartments, he mixed the soil in various proportions with arsenious acid, binarseniate of potassa, and sulphate of copper, and that he afterwards sowed in the earth, thus prepared, wheat, barley, corn, garden-cress, and peas. With respect to arsenious acid, he observed, that if the proportion mixed with the soil were too great, germination was prevented; in the contrary case, it took place without interruption, and the different parts (stalks, leaves,

* *L' Institut*, No. 397, August 5, 1841.

and seeds) of the plants which grew in these poisoned soils having been carbonised with nitric acid, did not yield any traces of arsenic in Marsh's apparatus. We may here remark, *en passant*, that the author does not appear to have freed the residue of the carbonisation of these plants from the nitric acid employed, before introducing it into Marsh's apparatus. He should have neutralized this acid with pure potassa, and then have driven off or displaced the nitric acid by pure sulphuric acid; for it is known that the presence of nitric acid in Marsh's apparatus may prevent the disengagement of the arseniuretted hydrogen, which is promptly oxidised or decomposed, under the influence of this acid.

The addition of binarseniate of potassa to the soil is opposed to the germination of plants, and therefore presented nothing remarkable.

Sulphate of copper did not prevent vegetation. The author also ascertained that it became insoluble in the earth with which it was mixed, doubtless by the decomposing influence of the carbonate of lime on this salt. The author could not detect traces of cupreous matter in the vegetables, which grew in the soil with which he had mixed the sulphate of copper; but as the analytical processes to which he had recourse on this occasion do not appear to us to have been executed with all necessary care, we entertain some doubt as to the absolute absence of copper from the vegetables, taking into the account the opposite results of different experiments tried by other men of science. It appears, indeed, from these experiments, that plants which have been raised in a cupreous or ferruginous soil, contain ever so little of these matters, which may penetrate them either in the state of carbonates dissolved in water charged with carbonic acid, or in the state of oxides dissolved by aid of certain principles of the earth.

The author also proved that by introducing into the soil, balls made with a mixture of arsenious acid and farina, as agriculturists often do, neither germination nor vegetation is in any way interrupted, and no arsenic is found in plants grown in this soil, although the poison is found in the earth, in the soluble state several months after its introduction.

The introduction into the soil of either arsenious acid or binarseniate of potassa in powder at the roots of wheat and garden-cress in full vegetation, did not injure those plants, and the poisons were not absorbed. It was not the same when the plants were surrounded with an arsenical solution. A strong plant of *Polygonum Orientale*, in full flower, having been surrounded by a solution of binarseniate of potassa, perished in about twenty-four hours, and the author succeeded in detecting the presence of arsenic, not only in the stalks and leaves, but in the seeds. It therefore appears that metallic poisons may penetrate into the seeds of vegetables, at least under certain circumstances: this was hitherto a matter of doubt.

The author observed, that we cannot by the same means cause solutions of metallic salts, which have the property of being decomposed and rendered insoluble in the earth, such as sulphate of copper, acetate of lead, &c., to penetrate into vegetables.

He afterwards examined the action of dissolved metallic compounds on entire vegetables plunged with their roots into the solutions; and he observed that in this case the metallic compound penetrated into all parts of the vegetable, and even into the seeds of the cereals from which he extracted it, by simply boiling the seeds in water. The author thus proved the penetration into all parts of the plants, of solutions of binarseniate of potassa, arsenious acid, bichloride of mercury, sulphate of copper, persulphate of iron, ferro-cyanuret of potassium, and acetate of lead.

From the results of the author's experiments we are tempted to believe that there is no danger to public health to be apprehended from the practice followed by many agriculturists of spreading arsenious acid in fields for the purpose of destroying animals injurious to the crops; for this poison, even when dissolved by the water of the earth, does not seem to be capable of penetrating, in any sensible quantity, into plants without stopping the vegetation, and thus preventing the ripening of the seeds. It is to be regretted, however, that the author's experiments do not seem to have been sufficiently numerous, nor made with enough care, and in circumstances calculated to dispel all doubts as to the accuracy of the conclusions at which he has arrived.—*Ibid.*

*Process for the Preparation of Urea.** *By* JUSTUS LIEBIG, M. D.

The ordinary process of extracting the urea from urine, consists, as is known, in precipitating by nitric acid, urine evaporated in the sand-bath, to a syrupy consistence, in purifying by repeated crystallisations the nitrate of urea obtained, and in decomposing it by carbonate of baryta or potassa; and finally, by separating, by means of alcohol, the urea from the nitrate of baryta or potassa. This is a tedious and expensive process: with 1875 grammes of nitric acid, we rarely obtained more than 64 grammes of pure urea, and in this respect, at the present low price of ferro-cyanuret of potassium, the following process deserves the preference.

Twenty-eight parts of perfectly dried ferro-cyanuret of potassium are mixed with 14 parts of peroxide of manganese, and both are reduced to as fine a powder as possible: the mixture is heated on an iron plate (not in a crucible) over a charcoal fire, to a slight red heat; at this temperature it inflames, and is gradually extinguished; by stirring it several times, it is prevented from agglutinating, and the access of air is facilitated. The extinguished mass, after being cooled, is treated by cold water, and the liquor is mixed with 20½ parts of dry sulphate of ammonia of commerce, or that purposely prepared by saturating sulphuric acid by carbonate of ammonia and evaporating to dryness. It is as well to set aside the first concentrated washing water furnished by the extinguished ferro-cyanuret of potassium, to dissolve, without heat, in the last, the sulphate of ammonia, and to mix the first with that solution. There is generally formed an abundant precipitate of sulphate of potassa; the supernatant liquor is decanted, and evaporated in a sand-bath or warm place, taking care to avoid boiling; there are again deposited crystalline plates of sulphate of potassa, and we must continue to decant the liquor until no farther separation is possible. The last decanted liquid is then evaporated to dryness, and the residue is treated by boiling alcohol of 80—90 per cent.; this dissolves the urea, which crystallizes on the cooling and evaporation of the alcohol, while the sulphates are not dissolved. This process furnishes us

* *Annalen der Chemie und Pharmacie*, Vol. xxxviii, page 108.

with 375 of ferro cyanuret of potassium, nearly 125 grammes of completely colorless and beautiful crystallized urea.

By the extinction in the air of ferro-cyanuret of potassium mixed with peroxide of manganese, very soluble cyanate of potassa is formed, which dissolves without decomposition in cold water; it must not be heated with water, as it is then decomposed, as is known, into ammonia and bicarbonate of potassa. When the cyanate of potassa is mixed with sulphate of ammonia, there are produced sulphate of potassa and cyanate of ammonia, which is converted into urea, at a gentle heat.

The quantity of oxygen of the peroxide of manganese, is not, as will readily be observed, nearly sufficient for converting all the cyanogen of the ferro-cyanuret into cyanic acid; but an increase in the proportion of this oxide, has the inconvenience of changing a portion of the cyanate formed into carbonate of potassa: it is better therefore, to obtain from the air the oxygen in which the peroxide of manganese is deficient. Experiments for converting all the cyanogen of the ferro-cyanuret of potassium into cyanic acid by the addition of the calculated quantity of peroxide of manganese and carbonate of potassa, have not given a better result than its extinction in the air with an insufficient quantity of peroxide of manganese.

It sometimes happens that the solution, which contains sulphate of potassa and urea, is colored yellow by the hydro-ferro-cyanuret of ammonia or potassa, which is dissolved in the alcohol and turns the crystals of urea yellow; it is easy to purify it by adding a small quantity of a solution of sulphate of iron. After the separation of the Prussian blue formed, carbonate of ammonia is added, which decomposes the excess of the salt of iron, and decolors the liquor. This is afterwards evaporated and treated in the manner indicated above.—*Ibid.*

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1842.

	MINIMUM TEMPERATURE, Observed at Sun rise.					
		Temperature.			Wind.	
Days of the Month.	Barometer.	Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.593	81.5	78.1	79.0	Calm, ..	Cirro-strati,
2	.661	82.0	78.0	79.0	E.	Generally Clear,
3	.666	82.0	79.2	80.0	Calm, ..	Cirro strati,
4	.634	82.8	80.4	81.0	Calm. ..	Cloudy,
5	.578	83.2	80.4	81.0	N. E. ..	Clear,
6	.515	80.5	78.2	79.0	N. E. ..	Nimbi,
7	.547	80.5	78.3	78.8	E... ..	Cloudy,
8	.581	81.1	78.5	79.0	Calm, ..	Cirro-strati,
9	.612	82.0	81.0	80.8	S.......	Cloudy,
10	.625	82.5	81.0	82.0	S..	Cloudy,
11	.570	83.0	81.8	81.2	S. W...	Cloudy,
12	.570	82.5	80.0	80.0	Calm, ..	Cloudy,
13	.662	82.3	79.0	79.4	N. E. ..	Cloudy.
14	.680	81.0	78.0	78.9	Calm, ..	Cirro strati,
15	.693	81.0	78.5	79.0	Calm, ..	Clear,
16	.700	81.2	78.9	79.4	Calm, ..	Light Cirro-strati,
17	.722	83.6	79.2	80.0	Calm, ..	To the E. Cirro-strati,
18	.720	83.8	79.5	79.0	Calm, ..	Light Cirro-strati,
19	.750	83.0	79.0	79.9	Calm, ..	Generally Clear,
20	.721	83.5	80.0	80.5	S.......	Cirro-strati,
21	.686	82.0	79.0	79.0	Calm, ..	Cirro-Cumuli,
22	.642	83.0	80.0	80.3	S.......	Cirro-strati,
23	.614	83.8	80.0	80.2	Calm, ..	Light Cirro-strati,
24	.686	8[illegible].0	79.9	80.0	Calm, ..	Cirro-strati,
25	.670	82.6	80.2	80.2	Calm, ..	Generally Clear,
26	.617	80.5	76.0	76.1	N. E....	Drizzly,
27	.617	80.2	78.0	78.0	N. E....	Nimbi,
28	.709	79.5	77.8	76.9	E.......	Generally Clear,
29	.749	80.7	78.0	77.0	Calm, ..	Clear,
30	.694	82.2	80.5	79.0	Calm, ..	Clear,
31						
Mean.	29.639	82.0	79.2	79.4		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1842.—(Continued.)

MAXIMUM PRESSURE.

Observed at H. 9. M. 50

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.650	84.4	86.0	84 0	E....	Cumul o-strati,
2	.70	83.0	83.0	82 2	E....	Cloudy,
3	.689	83.9	85.5	82.4	S. W.. ..	Cumuli,
4	.667	84.4	88.0	85,0	E...... ..	Cumulo-strati,
5	.589	85.9	88.5	86.4	N. E... ..	Cumuli,
6	.526	82.9	82.6	82.0	E....	Nimbi,
7	.610	79.0	76.5	76.8	S E... ..	Drizzly
8	.646	82.0	82.1	82.0	S.........	Cloudy,
9	.686	84.2	85.8	82.0	S....	Cumuli,
10	.658	85.8	87.8	85.0	S........	Cumuli,
11	.595	84 8	85.9	83.8	S. W.. ..	Cloudy,.
12	.609	85 0	86.5	85.0	N. E.	Scattered Clouds,
13	.658	83.4	85.7	83.8	E...	Cirro Cumuli,
14	.698	84.0	86.6	84.5	E....	Cumuli,
15	.782	84.0	86.9	84.0	S....	Cumulo-strati,
16	.762	84.0	86.6	84.0	S.........	Cumuli,
17	.769	85.0	88.0	84.2	S.........	Cumuli,
18	.782	84.8	87.0	84.0	S....	Cumuli,
19	.806	85.0	88 0	84.0	S....	Cumuli,
20	.770	85.0	86.4	84.0	S. W.. ..	Cumulo-strati,
21	.717	85.0	87.1	84.0	S. S. W..	Cumuli,
22	.685	85.0	87.0	83.0	S....	Cirro Cumuli,
23	.650	84.8	84 6	82.4	S. W.	Cumulo-strati,
24	.630	85.9	88.7	84.0	S. E.. ..	Cumulo-strati,
25	.645	85.5	90.0	84.8	E........	Cumulo-strati,
26	.645	82.7	81.0	80.0	E........	Cloudy,
27	.669	82.0	82.0	80.9	E........	Nimbi,
28	.774	84.1	84.0	81.0	S. E.. ..	Cumuli,
29	.769	82.9	84.1	81.0	S. E. ...	Cumuli,
30	.712	84.5	86.4	82.8	N. W	Cumuli,
31						
Mean.	29.685	84.1	85.6	83.1		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1842.—*(Continued.)*

Days of the Month.	OBSERVATIONS, Made at Apparent Noon.					
	Barometer.	Temperature.			Wind.	Aspect of the Sky.
		Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Direction.	
	Inches.	o	o	o		
1	29.634	86.1	89.8	84.8	E.	Cumulo-strati,
2	.689	84.3	86.0	84.1	S. E... ..	Cloudy,
3	.670	84.5	86.8	84.0	S.	Cloudy,
4	.641	87.5	89.6	87.0	N. E.. ..	Cloudy,
5	.570	88.0	90.0	88.0	N....	Cumuli,
6	.502	86.4	86.0	84.2	E.	Nimbi,
7	.600	79.5	78.4	78.5	S. E......	Cirro-strati,
8	.634	83.2	84.0	83.0	S.	Cloudy,
9	.664	85.5	86.0	84.3	S.	Cumuli,
10	.630	87.0	88.2	85.0	S.	Cumuli,
11	.574	86.0	88.5	85.0	S. W... ..	Cloudy and Haze,
12	.594	86.2	88.6	86.5	E.	Cloudy,
13	.678	84.5	85.8	84 0	E.	Cloudy,
14	.693	84.4	86.0	84.0	S. E. W..	Cumulo-strati,
15	.758	83.9	86.5	82.7	S. E.. ..	Cumulo strati.
16	.750	86.1	89.8	84.2	S...	Cumuli,
17	.750	86.8	90.5	86.4	S.... ...	Cumuli,
18	.765	86.1	90 0	85.0	S. W... ..	Cumuli,
19	.789	86.8	89.7	85.2	S.W.. ...	Cumuli,
20	.746	86.5	88.0	86.0	S.W......	Cirro strati,
21	.705	87.1	90.0	85.0	S. W.. ..	Cumulo-strati,
22	.665	87.0	89.2	84.9	S.	Cumuli,
23	.625	87.3	90.0	84.5	S. W... ..	Cumulo-strati,
24	.598	87.8	90.0	85.0	S. W... ..	Cumulo-strati,
25	.620	88.0	91.5	85.3	E.	Cumulo strati,
26	.614	85.0	88.0	84.5	N.E..... ..	Cirro-Cumuli,
27	.653	83.8	84.0	81.4	E...... ..	Cloudy,
28	.745	86.0	86.2	83.5	E....... ..	Cumulo-strati
29	.738	84.8	88.0	82.7	S. E... ..	Cumulo-strati,
30	.683	86.9	88.6	83.4	N. W.. ..	Cumuli,
31						
Mean.	29.664	85.7	87.8	84.4		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September 1842.—(*Continued.*)

MAXIMUM TEMPERATURE
Observed at 2 H. 40 M.

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Thermometer exposed to the Sun's rays.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o	o		
1	29.594	83.9	82.6	82.7	85.8*	S. E.	Nimbi,
2	.661	85 2	86.8	84.2	100 0	S.	Cumulo-strati,
3	.630	86.5	90.0	86.2	111.0	S. W.	Cumulo-strati,
4	.582	8 .0	90.0	87.0	100.0	E.	Cumulo-strati,
5	.521	88.8	94.0	89.0	126.0	N. W.	Cumuli,
6	.482	84.1	82 5	81.8	86.0*	S. E.	Nimbi,
7	.558	81.0	80.3	80 0	95.0*	S. E.	Cloudy,
8	.605	83.4	84.0	83.0	95.0	S.	Cloudy,
9	.610	86.0	87.4	85.0	99.0*	S.	Cloudy,
10	.594	88 0	90.4	85.8	101.0*	S. W.	Cumuli,
11	.554	86.6	88.0	84.4	94 0*	S. W.	Light Haze,
12	.563	82 8	80.7	80.0	85.0*	N. W.	Very Cloudy,
13	.606	84.4	84 5	83.9	94.0*	E.	Cloudy,
14	.645	84.5	87.0	84.8	113.0	E.	Cumuli,
15	.690	86.0	90.0	86.2	119.0	S. E.	Cumulo-strati,
16	.700	87 6	91 0	85.1	118.5	S.	Cumuli,
17	.689	88 4	91.2	86.0	117.0	S. W.	Cumuli,
18	.730	87.4	91.0	84.0	100.0*	S. W.	Cloudy Cumulo-strati,
19	.734	87.8	92.0	86.4	121.0*	S.	Cumuli,
20	.697	86.9	88.0	85.0	97.0*	S.	Cloudy,
21	.641	87.8	88.8	85.0	100.0	S. W.	Cloudy partially,
22	.618	88.0	89.4	84.7	102.5	S.	Cumulo-strati,
23	.589	88.3	91.0	85.0	108.5	S. W.	Cloudy(Cumulo-strati),
24	.541	86.0	89.0	88.0	100.0	N. W.	Cumulo-strati.
25	.573	90·2	94.0	86.2	122.0	E.	Cumulo-strati,
26	.593	81.9	79.0	78.6	84.0*	S. E.	Raining,
27	.626	81.0	78.5	77.0	83.0*	S. E.	Raining,
28	.718	82.0	79.8	78.5	84.0*	S.	Raining,
29	.690	86.0	90.6	84.0	120.0	N. W.	Cumulo-strati,
30	.684	88.0	90.0	83.2	102.0	N.	Cumuli
31	——						
Mean.	29.623	85.9	87.4	83.3	102.4		

N. B. The Asterisks in the column giving the temperature of the Sun's Rays signify that a Cloud intervened between the Sun and the Thermometer at the time of Observation.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1842.—*(Continued.)*

Days of the Month.	MINIMUM PRESSURE, Observed at 4 P. M. Barometer.	Temperature, Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.589	84.5	85.0	83.0	S.	Cloudy,
2	.650	86.0	87.0	84.0	S.	Cumulo-strati,
3	.618	86.5	87.3	86.2	S........	Cloudy,
4	.550	86.5	88.4	86.5	E., ...	Cloudy,
5	.485	89.8	92.0	89.0	N. E... ..	Cumuli,
6	.470	83.3	82.5	82.0	S. E......	Cloudy,
7	.560	81.1	80.8	80.5	S. E	Cloudy,
8	.590	84.1	85.0	84.0	S...... ..	Cloudy,
9	.594	85.9	86.5	84.0	S...... ..	Cloudy,
10	.554	87.8	88.6	85.7	S...	Cumuli,
11	.521	86.3	87.0	84.8	S. W.. ..	Cloudy,
12	.560	83.0	83.0	82.3	N. E... ..	Rain Thundering,
13	.594	83.6	84.0	83.0	E...... ..	Cloudy,
14	.638	84 9	85.9	84.0	S. E.	Cumulo-strati,
15	.677	86.4	88.3	86.0	S. W.. ..	Cloudy Cumulo-strati,
16	.686	87.8	89.0	84·0	S. S. W...	Cumuli,
17	.677	88.5	90.0	86.5	S. W.. ..	Cumuli,
18	.709	86.5	88.0	85.0	S. W.	Cumulo strati,
19	.709	87.8	90.0	86.0	W. S. W.	Cumuli,
20	.673	86.2	87.0	85.0	S....	Cloudy,
21	.688	87.4	88.5	85.0	S.	Cumuli,
22	.594	87.0	87 0	83.0	S.	Cloudy.
23	.570	86.9	88.0	84.0	S.	Cloudy Cumulo-strati,
24	.538	87.5	90.0	83.4	W. S. W..	Very Cloudy,
25	.565	88.0	90.0	85.1	E....	Cloudy,
26	.590	81.5	79.0	78.5	E....	Nimbi,
27	.625	81.8	80.2	79.0	E...... ..	Nimbi,
28	.7 3	82.8	82.0	80.2	N..	Cloudy,
29	.678	86.7	90.0	83.2	N. W. ...	Cumuli,
30	.625	88.6	89.5	84.0	N.	Cumuli,
31						
Mean.	29.608	85.8	86.3	84.2		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September 1842.—*(Concluded.)*

Days of the month.	OBSERVATIONS, Made at Sun set: Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.	Rain Gauges. Upper.	Rain Gauges. Lower.	Moon's Changes.	Moon's Horizontal Parallax at Noon
	Inches	o	o	o			Inches	Inches		
1	29.594	84.0	83.3	81.0	S. E.. ..	Cloudy,	0.13	0.16		60
2	.658	84.0	83.8	82.0	S..... ..	Cloudy,				61
3	.928	85.4	85.5	84.0	Calm, ..	Cloudy,	0.07	0.08		61
4	.550	85.0	84.0	83 2	E..... ..	Cloudy,				61
5	.489	88.0	87.0	86.5	Calm, ..	Cloudy,	0.52	1.61	●	61
6	.490	82.5	79.3	79.4	S. E.	Nimbi,	0.67	0.77		61
7	.562	81.0	80.0	80.0	S. E.. ..	Nimbi,				61
8	.593	83.3	83.0	82.8	S. E.	Cloudy,				59
9	.597	84.7	84.9	83.3	S...	Cloudy,				58
10	.558	85.0	85.5	84.0	S.	Cloudy,	0.30	0.30		57
11	.521	85.8	84.2	83.1	Calm, ..	Cloudy,			☽	56
12	.578	83.4	79·9	79.7	Calm, ..	Drizzly,	0.41	0.46		55
13	.597	82.8	81.9	81.7	E..... ..	Cloudy,	0.11	0.14		55
14	.649	82.2	82 9	82.4	Calm, ..	Cirro-strati,	0.08	0.11		55
15	.677	83.4	82.0	81.0	S. E.. ..	Very Cloudy,	0.06	0.08		54
16	.690	86.0	86.2	83.9	S. W.....	Generally Clear,				54
17	.680	87.0	87.4	84.2	S..... ..	Raining Thunder	0.17	0.22		54
18	.710	85.9	85.0	84·0	S...	Generally Clear,	0.06	0.09		54
19	.714	86.5	87.5	84.4	W..... ..	Cirro-strati,				54
20	.650	85.6	84.9	83.7	S. S W...	Cirro-strati,			○	54
21	.640	86.0	85.3	83.0	S...	Cloudy,				54
22	.612	86.0	84.3	82.3	S. W.....	Cloudy,				55
23	.578	85.2	85.2	84.5	Calm, ...	Cirro-strati,				55
24	.546	84.3	81.3	80.0	S. W.....	Cloudy,				56
25	.568	86.3	87.3	82.5	Calm, ..	Cloudy,	0.11	0.15		56
26	.590	80.0	78.0	78.2	E..... ..	Raining,	0.24	0.27		57
27	.629	81.8	80.9	79.0	E...	Cloudy,	0.27	0.34	☾	58
28	.717	82.3	81.8	80.2	Calm, ..	Cloudy,	0.15	0.22		59
29	.634	85.0	86.9	82.2	N. W. ..	Cirro-cumuli				59
30	.629	86.6	87.0	83.0	N. W. ..	Generally Clear,	0.05	0.08		60
31										
	29.614	84.5	83.9	82.3			3.29	4.08		

The Observations after Sunset are made at the Hon'ble Company's Dispensary.

Days of the month.	OBSERVATIONS, Made at 8 P. M. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	OBSERVATIONS, Made at 10 P. M. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	OBSERVATIONS, Made at Midnight. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.
	Inches	o	o	o	Inches	o	o	o	Inches	o	o	o
1	29.750	84.25	84.0	83.0	29.750	84.25	83 0	81.0				
2	.850	85.0	84.12	83.36	.850	85.0	84.12	83 36				
3	.850	85.0	85.0	84.12	.850	85.0	84.25	83.36				
4	.750	85.25	85.0	83.25	.750	85.25	85.0	83.25				
5	.700	85.25	85.0	82.25	.700	85 25	85.0	82.25	29.700	85.25	83.25	82.25
6	.725	85.25	85.0	82.36	.750	77.25	82.25	80.3				
7	.750	85.25	85.0	82.25	.725	85.25	85.0	82.25				
8	.800	84.0	83.25	83.0	.800	84.0	83.25	83.0				
9	.750	84.0	84.25	82.25	.750	83.25	84.0	82.0				
10	.775	84.25	84.0	82.36	.750	83.25	84.0	82.0				
11	.725	86.25	86.0	85.25	.800	86.0	85.0	84.0				
12	.800	83.0	85.5	82.25	.810	83.0	83.0	81.25				
13	.850	83.25	83.0	82.25	.850	83.25	83.0	82.25				
14	.900	85.0	84 12	83.25	.900	84.36	84.0	83.16				
15	.900	84.0	84.25	83.0	900	85.0	84.25	83.12	.900	84.0	84.0	81.25
16	.900	86.0	85.36	85.0	.950	85.25	85.0	84.25				
17	.900	86.16	85.36	85.12	.925	86.0	85.12	84.36	.925	85.25	85.0	84.1
18	.900	85.0	86.0	84.0	.950	85.0	85.25	82.25				
19	.950	86.25	85.25	85 0	.950	85.0	85.25	84.36				
20	.875	86.12	85.36	85 0	.825	86.12	85.25	85.0				
21	.850	85.0	82.25	83.25	.850	85.0	84.20	82.36	.850	84.25	84.12	84.
22	.750	85.25	85.0	84.0	.750	85.25	85.0	84.0				
23	.875	87.0	86.12	85.25	.800	86.0	85.36	84.36				
24	.800	85.0	85.2	82.25	.800	85.0	85.0	82.0				
25	.800	86.0	85.0	84.36	.825	85.25	85.0	84.25				
26	.800	88.0	82.36	80.25	.800	83.0	82.36	81.0				
27	.850	83.0	82.25	80.36	.850	82.0	82.0	80.0				
28	.950	84.12	83.12	83.0	.900	84.0	83.12	83.0				
29	.850	85.25	85.0	84.25	.875	85.25	84.36	84.0	.900	85.0	84.25	84.2
30	.875	86.0	86.0	84.0	.875	85.0	85.36	84.12				
31												

N. B. From a comparsion of the two Barometers, the Mercury in that at th Dispensary stands 1-10th of an inch higher than that in use at the Surveyor General's office.

Monthly Proceedings of the Society.

The Honorable Sir J. P. Grant, President, in the chair.

THIRTY-ONE MEMBERS PRESENT.

The Honorable the President opened the business of the day by stating, that the present meeting was summoned, in pursuance of a resolution, passed at the general monthly meeting, held on the 14th ultimo, to the following effect:—" That a special meeting be held on the first Wednesday in October 1842, to take into consideration, the proposition of Dr. Huffnagle, and the amendment of Dr. Corbyn"— and he desired the Deputy Secretary to read the motion made by Dr. Huffnagle, and the amendment of Dr. Corbyn.

They were read as follows:—

Moved by Mr. Huffnagle, seconded by Dr. Grant.

"That the Secretary of the Society and Editor of the *Monthly Journal*, pay to the Assistant Secretary, the sum of one hundred rupees per month, from the proceeds of the journal, derived from the additional eight rupees levied from subscribers."

Moved by Dr. Corbyn, seconded by Mr. Piddington.

" That the *Monthly Journal* be considered the property of the Society, and that the Secretary's salary in remuneration for his labour in conducting it, be encreased from 300 to 400 rupees per mensem, and instead of 8 rupees per annum being considered a distinct charge for the journal, that the quarterly subcription of each member be encreased from 8 to 10 rupees."

The President then stated that Dr. Corbyn's motion being an amendment on that of Dr. Huffnagle, it would be necessary that it be first submitted to the meeting.

Dr. Huffnagle begged leave to withdraw his motion,—and Dr. Corbyn requested,—seconded by Mr. Piddington,—to be allowed to substitute the following words for the motion of which he had given notice:—

1st. " That the Journal of the Society shall become the property of the Society, that the subscriptions shall be in future ten rupees quarterly, that the salaries of the Secretary and Deputy Secretary be increased, the former to rupees 400 per mensem, and the latter to

Rs. 300 per mensem,—and that it be incumbent upon the Secretary to edit the new journal."

Mr. Hume moved the following amendment, seconded by Mr. Adam F. Smith :—

"That the salary of the Deputy Secretary be increased to 300 rupees per mensem in acknowledgment of his long and meritorious services."

The amendment was put to the vote, and negatived.

The original motion was then submitted, and carried by a large majority.

AMERICAN GARDEN AND COTTON SEEDS.

The President mentioned, that a question had arisen which it was very desirable should be disposed of, if the Society should agree to enter upon it at this meeting, notwithstanding its being a special meeting. The meeting having agreed so to do, the President stated, that the question he alluded to, was connected with the payment of the amount for the invoice of seeds lately received by the Society from America. The members, who were present at the last meeting, would recollect that the Report of the Finance Committee, recommending the payment of this amount, if the seeds were in a "merchantable condition,"—was then confirmed. It would appear, however, that there was a difference of opinion in the Finance Committee in regard to the authorising the payment of this sum on the terms demanded by Dr. Huffnagle.

The President then read the correspondence which had passed on the subject since the last meeting, and left it with the Society to determine as to the settlement of the question.

It was moved by Dr. Grant, seconded by Dr. Mouat and resolved

"That Mr. Staunton do sign the letter of authority addressed to the Government Agent, and that the amount of Dr. Huffnagle's demand be paid."

Moved by Mr. Robert J. Lattey, seconded by Mr. Piddington, and unanimously resolved

"That the thanks of the Society be given to Dr. Huffnagle for the kind trouble he has taken in procuring the supply of seeds lately received, through him, from America."

Mr. Hume intimated that there were a few propositions which he should wish to put at this meeting, although it was a special one, if allowed so to do. The meeting having agreed to entertain them, Mr. Hume begged, in the first instance, to move the following, which were put to the vote, and carried unanimously.

Moved by Mr. Hume, and seconded by Dr. Huffnagle.

"That Dr. Mouat be permanently appointed to the Committee of Papers, in the room of Mr. Johnson returned to England. and Dr. John Grant in the room of Dr. Wallich, absent at the Cape."

Moved by Mr. Hume, and seconded by Mr. Staunton.

5th. "That the President of this society, do address the Secretary to Government, regarding the late suspension of the privilege of free postage to letters on the business of the Society, and the free transmission of the Monthly Journal."

NOTICES OF MOTION.

Mr. Hume further desired leave to submit the two following motions for discussion at the next meeting :—

Moved by Mr. Hume, and seconded by Dr. Huffnagle.

1st.—"That the subscriptions already compounded for, under article V. of Regulations, March 11, 1835, remain unaffected by the additional subscription decided upon this day."

2nd.—Moved by Mr. J. W. Roberts and seconded by Mr. Hume.

"That the Journal be open to the public, at an annual subscription of sixteen rupees, and for a single number, one rupee eight annas."

The President said, that before the meeting broke up, he wished to inform the Members, that he had thought it his duty in consequence of Dr. Mouat's resigning the contest for the Secretaryship, on the ground as was understood of the Government being disinclined to permit a gentleman in their Medical Service to accept that office, to ascertain how that matter stood. He had therefore commenced a correspondence with some persons in an official situation for that purpose. That correspondence was not yet brought to a close. But before the day of election he should be able to state to the members the final resolution of the Government upon the subject; and in the meanwhile, he hoped, gentlemen would see the propriety of not

pledging their votes, till this was known, and all candidates might be fairly in the field.

Dr. Mouat explained, that he had permission to state to the Society the cause of his withdrawal, which was in consequence of an intimation, that Government did not wish him to encumber himself, in addition to his present duties, with those of the Secretaryship to the Agricultural Society.

ERRATUM.

In Journal No. III, page 210, at fourth line from top, for "T. H. Maddock, Esq., Secretary to the Government of India," read, J. R. Colvin, Esq., Private Secretary to the Governor General.

THE

MONTHLY JOURNAL

OF THE

AGRICULTURAL AND HORTICULTURAL

SOCIETY OF INDIA.

VOL. I. DECEMBER 1842. No. V.

Further observations on the present imperfect mode of cultivating Sugar Cane, and manufacturing Sugar in India. Communicated to the Society, by a late West India Planter.

In continuing my observations on that now interesting subject, Sugar, I shall feel proud, if they be deemed worthy of insertion in the Society's Journal.

The more I see of India, the stronger my conviction is, that those now engaged in Cane cultivation, are not following the course necessary to make it a great Sugar country, and perhaps, when too late, they will discover the mistake they have committed, by adopting a plan of operations of which they are ignorant. I allude now to the present system observed towards Cane agriculture. I most confidently assert, that a Sugar estate never can succeed conducted on the Ryot system, a system very applicable to Indigo, but the one and the other being different and distinct plants, so must be their method of culture. As during my short residence in India, I have frequently been asked by interested parties, "could we not grow Sugar this year and Indigo next?" my answer invariably was, "yes, you *could*, but as regards the former it

would not be attended with success." I shall prove this hereafter. *Consequently we must have no Ryots, such a cultivation being too extended, and affording too many ways and means for plunder. No! concentration of cane land is the great object,* the great desideratum, which, once obtained, *a judiciously managed estate must flourish; but the idea of* planting Cane in *the same manner as Indigo, in small patches* here and there, owned by numerous different people, scattered over a large extent of land (I know some places where Cane was cut 14 to 20 miles) and each patch the produce of a different seed and soil, the irregularity and difficulty of carriage to the mill, the awful and wilful sacrifice of money, that must necessarily and consequently be incurred in the employment of superfluous labourers and carts, the quarrels among the Landowners and Ryots, render the entire measure a decided loss, of both time and funds, and though last not the least valuable consideration to a Sugar planter, and what is entirely lost sight of, is the *ratoon cane,* without which his produce cannot be first quality, as plant liquor boils both red and soft, owing to its richness and other causes, requiring deep mixture with that of first, second, third and fourth ratoons. Failures and consequent embarrassment will bring conviction that cane cannot be planted, or a superior Sugar made from plant cane alone. A thorough knowledge of the cultivation and manufacture thereof, can be gained only by 3 or four years hard work as Overseer, added to a subsequent long experience as Manager: be it remembered the duties of a planter in charge of a Sugar Estate are many, and onerous, particularly in this country, where in the onset everything would be up hill work, owing to the prejudices of those with whom he has to deal. Such a man is averse to the word *impossibility,* or *such and such a thing cannot be accomplished.* He is reared in a school which teaches him, that what is necessary must be done, consequently his first business would be to entirely revolutionize the present system of

Cane agriculture—vizt. ploughing, hoeing, planting, weeding, moulding, drawing, trashing and cutting. Then his attention is turned to his indoor work—reorganization must also take place here as to boiling, skimming, tempering, striking and potting. In fact native systems and prejudices must be extirpated root and branch; that gained, every thing goes on smoothly and profitably. In a country such as this, blessed as it is with every natural advantage, a proper application only of the means within our power is requisite to ensure a supply of Sugar unequalled in quantity and quality.

It is lamentable to see those gifts of nature lie dormant, and completely under the ignorant agricultural guidance of the natives who are content with small profit and little labour. I here must be permitted to express my regret, that those Gentlemen who have endeavoured to establish and encourage Cane cultivation, and to whom great praise is due, should in the first instance have followed a mistaken course—a course singular in itself and adopted in no place out of India.

As I before observed, a Sugar Estate, to turn out a profitable speculation, must *be concentrated;* the works placed exactly in the centre, so that the Mill can command its food from all parts equally; the consequence is a great saving of labor, time and money. I will thus illustrate it—(*See plate fig.* 1.) the outer square is the Estate, the inside one the Works—how much superior is this, over one laid out thus. (*Plate fig.* 2.)

The former is the general plan of West Indian Estates, but I managed one on the latter principle for 8 years, and the consequence was my work was nearly double that of my neighbours.

Now we will suppose the first great difficulty, the attainment of the land, overcome—I shall at once proceed to open to view the gross revenue to be derived therefrom, and as nearly as I possibly can, conjecture the expenses indispensably necessary for the cultivation of the Estate, and the manufacture of the produce on the West Indian system. I cannot

err very much on this side of the question, being already thoroughly acquainted with my subject. I shall not attempt to speak so confidently as to the correctness of my calculation, relative to the estimate of the system, of manufacturing Sugar from Goor.

I throw myself on the indulgence of my readers, and entreat them to make allowances, for any discrepancies that may appear, although from enquiries made, I have been informed, that I am not very far from the mark. Therefore I commence with the West Indian plan and its results.

Expenses of conducting a Sugar Estate in India on the West Indian system—*Open pan.*

Rent of Land on which Cane sufficient to produce 750 tons of Sugar might be cultivated.	£400	0 0
Salaries-1 Engineer £150, Manager £500, Overseer £120	770	0 0
Coals 500 tons at £1:5 ℔ ton.	625	0 0
Labourers—150 for the field, Rs. 3 ℔ month, Rs.5,400, 30 for works, Rs. 6 for 6 months, Rs. 1,080, 10 Jobbers Rs. 6 for 12 months, Rs. 720, total Rs. 7,200 at 2*s*. ℔ rupee.	720	0 0
1 European Cooper £150. 4 Native Do. Rs. 5 per month for 12 mos. Rs. 240 = £24. . . .	174	0 0
Tools, Hoes, Cane Bills &c. £120. Incidentals, £1500.	1,620	0 0
Total.	£4,309	0 0

Add to this interest on Block.

Revenue from above Cultivation.

750 tons Sugar = 20,454 mds. selling to nett Rs. 10 ℔ md. Rs. 2,04,540 at 2.	£20,454	0 0

70,000 Gallons Rum to nett in Calcutta Rs. 1 per gallon. Rs. 70,000 at 2.	7,000	0	0
	27,454	0	0
Expenses as above. .	4,309	0	0
Nett revenue to pay interest on Block.	£23,145	0	0

Expenses of conducting a Sugar Factory on the East Indian system. *Vacuum pan.*

Khaur will yield on an average 50 per cent of boiled sugar; *Vacuum principle.*

To produce 750 tons Sugar we should require 40,909 mds. Khaur, which at Rs. 4 per md. Rs. 1,63,636 at 2.	£16,363	12	0
Boat hire to Factory, say at Rs. 3 per 100 mds. Rs. 1,227 at 2 per Rupee.	122	14	0
Salaries.—Manager £500. Two Agents to buy Goor (Rs. 150 per month each) £360.	860	0	0
Boiler £300, Coals 1000 tons, say at £1 5 per ton £1250.	1,550	0	0
25 labourers 6 mos. at Rs 3 per mo. Rs. 450, 25 for 6 mos. at Rs. 6, Rs. 900, 10 Jobbers 6 mos. at Rs. 6 per mo. Rs. 360 total Rs. 1,710 at 2. .	171	0	0
European Cooper £150. 4 Native Do. 12 mos. Rs. 1 per month Rs. 240 at 2*s*. £24.	174	0	0
Tools £20. Incidental expences, £1000.	1,020	0	0
Total.	£20,261	6	0

To this must be added interest on Block.

Revenue from above Factory.

750 tons or 20,454 mds. of first quality Vacuum Sugar would fetch in Calcutta (deducting river freight and Agent's Commission) Rs. 11 per md. or Rs. 2,24,994 at 2.	22,499	8	0

The above would yield stuff to make 50,000 Galls. Rum, say as above at 12 As. ℔ Gallon, Rs. 37,500 at 2.	3,750	0 0
	£26,249	8 0
Expenses as above.	20,261	6 0
Nett to pay interest on Block &c..	£5,988	2 0

On West Indian system nett revenue £23,145, on East Indian £5,988 2 0; difference in favour of former £17,156 18 0.

The present dangerous state of the Sugar Market deserves attention. It is a matter that concerns us all more or less, should this country fail in its produce, and as is generally feared an alteration of the Sugar duties, by the admission of foreign Sugar, the growth of Slave Colonies into the mother country, the consequences would be most disastrous to all those whose capital is at stake. It is now generally understood that Goor and Khaur will be very limited next year, owing to the almost total destruction of the Cane in Bengal, caused by storms and inundations. The date trees are also seriously injured, and in many places literally torn up by the roots. Now as regards the Cane, were the cultivation under the management of *properly experienced* planters, the injury from inundation would be materially lessened by draining &c., &c. &c.

Another point that requires serious consideration is the inferior quality of the East Indian Rum, which, under the present system of manufacture, never can compete with that of the West Indies, owing to the want of the Cane skimmings, without which, no machinery, experience, or care in the process, can produce a spirit equal in quality to that of our Western Colonies.

I shall now conclude, fearing I have already occupied too much space and interfered with other more important matters, and I also refrain from offering any advice as to the method of planting and manufacturing, as the idea gained thereby would be merely theoretical, which, in this case is of no use: practical knowledge alone is to be depended on.

On New Zealand Hemp,—with an account by Mr. WILLIAMS, *of an unsuccessful attempt to establish a manufactory at Port Macquarie.*

(Presented to the Society, by Dr. F. P. STRONG.)

New Zealand Hemp from its fine appearance, was formerly supposed to be a species of flax, but repeated samples of it having undergone strict examination, by the best judges in England and Russia, it has been deemed a superior Hemp.

The very fine, and silky quality of this, renders it much lighter than any other, and cordage well manufactured from it, has proved one third more in strength than any thing of the kind, the world has yet produced; the many advantages possessed by this Hemp over all others are therefore apparent.

First.—Cables manufactured with it, have the important advantage of taking up much less room in a Ship, and also, giving her equal security with any other cable, one third larger, while at anchor; and the texture of this Hemp too, is less susceptible of friction than any other.

Secondly.—If manufactured into Sails, a Mainsail, or any other, will stand one third more in strength than the European ones; consequently, afford one third more security to a Ship beating off a lee shore, or wherever desperate circumstances oblige her to carry on: besides, the great durability of the few sails that have already been manufactured from this Hemp, is incredible.

Thirdly.—The Hemp of New Zealand imbibes, and retains tar sufficiently; can be brought to answer every marine purpose, where such is applicable; and with a superiority, which can only be rivalled by a superior discovery.

Fourthly.—Its silky and smooth appearance gives it a preference in any market, when manufactured into rope of all descriptions, twine, and string; and this, coupled with a trial of its strength with any other of the same size, will do away with all prejudice, if any existed, against its solid properties.

Fifthly.—In making canvass, duck, coarse cloth, and thread, it may be most advantageously applied; and its durability and wear, if brought forward, would prove a certain pledge for extensive manufacturies in any country, which first had the credit of introducing it.

THE HEMP PLANT

Is found in all parts of New Zealand, but supposed to exist in great abundance on the West Coast, where the Natives make clothing of it; but even worked up in this state, the natural surface makes amends, in some degree, for the rude manufacture. It grows spontaneously, and in such abundance that places have been discovered covering the face of the country with it, for five or six miles in circumference, and growing from two to ten feet in height.

There are several qualities of the Hemp, according to the situation of the land, but it appears the largest kind, that which grows from 6 to 10 feet high, delights in a situation next the sea, and with regard to ground, will either bear wet, or dry; and what is most extraordinary, it has been observed flourishing even three, or four feet under salt water, where the tide ebbs, and flows regularly.

The Hemp plant will grow in any soil, and as before observed there are distinct species of them: the first being from six to ten feet high, from its gigantic size, is best adapted for cables, and lower rigging, the second for cordage, and the third, producing the smallest Hemp, does not exceed three feet, and is calculated for the finest purposes.

The plant produces seed in long black pods, in shape resem-

bling the sweet-pea, and in great abundance, but it requires much time, and indeed it is almost impossible to bring any seed to perfection, therefore no dependence can be placed in its propagation by this means; on the other hand the plant itself is hardy, and may be had to any extent.

On the 14th January, 1818, three plants were slipped off one root at Sydney,* and planted in a small tub, sent on board the Ship *Ocean*, but taken out of that ship at Batavia on the 15th April, and re-shipped on the 2d July on board the Brig *Hope*, for Padang, which vessel arrived there on the 10th of the following August, when the plants appeared still growing, and healthy; they were then unfortunately destroyed by the Captain's sheep, which accidentally broke loose from the long boat in the night. Thus, with all these disadvantages, and braving many climates, the plants were preserved in a flourishing state for six months, and twenty seven days.

It is well known that many of the Islands will grow the Hemp plant, particularly Norfolk Island, where the climate is extremely warm; and I have observed them at Port Jackson, from six to ten feet high, growing with a luxuriancy as if indigenous to the country. From these plants some fine specimens of canvass, rope, thread, and twine, have been manufactured, as the accompanying musters will testify.†

The growth and production of the New Zealand Hemp is prodigious. One slip or plant, from the Governor's garden at Sydney, in June, 1813, was cut three times in less than two years, and these were divided into nine slips; the whole of these plants produced young leaves an inch long, in seven days.

At Port Jackson, thirty distinct roots were divided from one stool or root; one of these sections or plants, was

* By Thomas Lockier, a passenger on the *Ocean*, from England to Calcutta.

† Sent to England.

exposed for several days to the sun, and wind, and then planted; and eighteen months afterwards, this plant produced nine more; these were transplanted and in eight months, produced eight pounds of Net Hemp; and the following year that quantity was trebled: from this statement, and allowing much for contingencies, it will appear, upon a moderate calculation, that every yard of land, will produce six pounds of Net Hemp annually.

The Hemp requires no culture except to extend and propagate it; the root should be regularly set in rows four feet from each other, and in three years would, if allowed, be united in one mass, and thrive equally well, without further attention.

From one stool or root, which did not occupy more than four feet of ground in circumference, were cut eighty four blades, which produced ten pounds of Net Hemp, (nine feet long when cleaned) which was cleaned in the presence of Governor Macquarie, at the rate of one pound in every five minutes by one man: thus, by this calculation, every beegah of land will produce about four tons of Net Hemp; but from plants arrived at their proper strength, and luxuriance, much more than this quantity, may be expected.

Great attention and care has been taken, to distinguish the proper season for cutting the Hemp; but little, or no difference in this respect, has been discovered; the natives of New Zealand allow no preference of season, and long practice corroborating this information, proves, that it may be gathered every month in the year, and give Hemp of equal quality, if cut in succession; so that, before the whole of a large tract of Hemp could be gathered, the first cut would again be ready for the knife.

It must be acknowledged that this written description appears too sanguine, and if carried into extensive practice, would not at first, in all probability, realize the speculator's expectations; but with great allowances, and

under all the difficult circumstances, it is well worth a trial, for if the Hemp of New Zealand could be cherished under the fostering hand of some rich capitalist, and naturalized in the rich soil of India,* it would certainly be attended, with great mercantile and national consequences.

I cannot give a just idea of the value of the Hemp Plant of New Zealand, without going to great lengths by way of explaining the several trifling attempts that have been made use of to introduce it to public attention and service, and the reasons why those attempts have not been carried into effect.

The Hemp of New Zealand has been an object of attention from our earliest knowledge of that Island. Governors Philips, King, and others, have paid attention and made great efforts to introduce it, but the best mechanics of Europe have failed in their attempts to manufacture it at any moderate labour and expence, and all further attempts were deemed useless for several years, the above mentioned Hemp requiring a different process of manufacturing, to any before known or practiced, on hemp or flax in any part of the world.

In 1810 Mr. Lord sent an expedition with an able artist at the head of it, with a great assurance of bringing it to perfection, but the vessels returned without performing any thing for want of a proper method of manufacturing it, and the only profits of the expedition were a few musters of the natives' dressing, whose method is too tedious to supply a large demand, and even what they could supply would not answer the purpose of British manufacture, which has been well determined in England; thus Mr. Lord gave up any further attempts.

Being bred from infancy to the manufacturing of hemp and flax in the county of Shropshire, and having as a flax dresser and rope maker, performed those branches in several parts of the globe, and made use of materials unknown in England, I determined to try a new method with the New

Zealand Hemp, and have found it possible to manufacture it. My next endeavours were to perform it by a speedy and simple system, and at such expence as would admit the exportation of it to a British market: my means were very limited and circumstances embarrassed, but well knowing the encouragement held out by the British Government, for procuring hemps at this time, I persevered in the pursuit, and had the satisfaction to surmount all obstacles, and to satisfy myself that this hemp may be rendered fit for use at less labour and expence than any hemp in the world.

I then conceived my labour would meet with encouragement from the Governor, knowing that hemp was an article of importance to the British Government at home, and this colony being in distress for cordage, and knowing myself capable of introducing a system of relief, I represented it to the Governor by memorial, accompanied with samples of Hemp and Cordage in different stages of manufacture, but the Governor did not pay much attention to it, telling me he did not understand it. I then told Mr. Lord what I was able to perform. Mr. Lord proposed an engagement, but not with such encouragements as I conceived myself entitled to, I therefore declined it, and represented the business to Messrs. Hook, Birnie, Blaxcell and others, but my proposals were cooly received. Although the business met with so many miscarriages, they did not induce me to decline my pursuits, and having a few of the plants in the country, I continued to improve my method and gain experience, and produced such samples as convinced the public that something might be done. Mr. Lord again made proposals, but we could not come to terms to my satisfaction.

Messrs. Birnie, Hook, and Gordon, requested me to make proposals, which were agreed upon, to send a vessel with 20 men and other means requisite, to perform such manufacture as I should point out, if I gave proofs that my method of manufacturing answered the purpose. After signing our

agreement, I produced such proofs of my abilities to perform more than I had proposed, that Mr. Birnie wished to commence on a much larger scale than had been proposed, but the question was, whether a sufficient quantity of the Hemp Plant was procurable. Such were the hopes I had given that instead of commencing on the small scale proposed, Mr. Birnie determined to send a vessel and explore the Island, and if the Hemp were in sufficient abundance, to make choice of the most suitable place for establishing our manufactory, to return, and then to commence on a very extensive scale, and make use of every means that could be applied. This went beyond my engagement to go more than once, and Mr. Birnie proposed my waiting for the vessel's return, but having made my arrangements for the voyage, and observing that some information might be acquired, I accompanied the expedition.

When we made our agreement, I understood we were to coast the west side of the Island to the south Cape, where we had been informed, was the greatest abundance of Hemp. Mr. Jones represented the west coast as too dangerous for us to approach, so that the first land we saw was Solanders Island in about 20 days, (very fine weather, but variable head winds) and the same night came to anchor in Port William in Favoux straits, a very safe and still harbour, land locked on all sides ; the next day it began to rain and blow very hard, we laid very snug, but Mr. Jones did not think so: he said as there was no Hemp in Port William, and the weather continuing bad for several days, that there were no hopes of doing anything more, and as the wind was fair for Sydney we had better return. Mr. Gordon seemed very much interested in our expedition, and would not consent: at length the weather clearing up a little, Mr. Gordon and I went on shore to try some experiments on the Hemp, when Mr. Gordon had the misfortune to cut his leg very dangerously with an axe: with no boat on shore, and a long way from the Brig, it was

night before we could get a boat to take us on board: this was a misfortune to our expedition, for the only hope of seconding my exertions was Mr. Gordon, and he was now confined to his cabin. Mr. Murray, Master of the vessel, was well acquainted with this part of the Island, and represented the Hemp to be in great abundance on the opposite side of the straits on the main, but as he was not sure of safe anchorage ground for the vessel,it was determined to cross the straits with the boats. Mr. Jones, Mr. Murray and five hands in one boat; and Mr. Smith 2d officer, with five hands and myself in the other boat, all armed, with provisions for several days, we went in pursuit of the five objects, which are necessary; namely; abundance of Hemp, wood and water, means to collect them, and anchorage for the vessel. Favoux straits, is about 25 miles over from Port Williams to Port Macquarrie, the entrance of this Harbour was supposed to be a reef of sand banks, but Mr. Murray sounded it from side to side, and found plenty of water for vessels of burthen, and anchorage: inside we met with a native, at the entrance of the bay, who seemed glad to see us, but we could get no information having no person who understood his language: we were at a loss where to land, and the tide ebbing we grounded several times, the native appearing indifferent on the subject; at length we landed, and gave our new companion to understand that we wanted to find his village; he readily made signs to follow him, we left the boats in charge of four hands, and travelled several miles over marshy sand covered with Hemp, (in general over the shoes in water,) with no timber of any kind. Mr. Jones wished to decline going farther, so that Mr. Murray and myself proceeded on, till we came to a large bay covered with water. The native informed us that it was fordable. Mr. Jones declined proceeding, and returned with the carpenter to the boats. Mr. Murray, myself and the rest of the party crossed the bay which was only knee deep, with a hard sandy bottom. We

crossed a ridge of hills and valleys covered with Hemp; on the opposite side we came upon a village, the inhabitants of which were chiefly women, children, and a few old men. They gave us to understand, that the men were gone on some expedition for some time, but I was apprehensive they were lying in ambush; we spent the night with them, (keeping a watch during it) and they made us as comfortable as they could, in their huts. In the morning, Mr. Murray and I examined the source of the bay, we crossed the day before, and when we signified our intention of returning, the women loaded themselves with large baskets of potatoes, and accompanied us to the boats. We found the large bay which we crossed the day before completely dry and covered with paradise duck, which induced me to name it Duck Bay. The natives took us a shorter cut back, and we found Mr. Jones with the boats high, and dry. After getting some refreshments, I asked Messrs Jones and Murray to accompany me in search of a nearer cut and a better road to Duck Bay, which I thought existed from my observations of the previous day, for though we had seen plenty of Hemp, wood and water, still there would be great difficulty in collecting them. We came to a thick bush, where I expected to find a passage, but my companions declined attempting it. I proceeded alone and found it a complete barrier of bush and old timber which had fallen down from age. On the eve of returning, I fell in with an old beaten path that took me through to Duck Bay, where I found a large valley of the best Hemp we had seen, and as regularly set, as if planted by man. In the middle of this bush I found an old tent hut, fallen with age, and it was visible that the tide from Duck Bay met here, which I considered an object of importance to our undertaking, as a little labour would open a passage from sea to sea, in the centre of every thing we wanted. I had some difficulty in making my way through the Hemp and Fern, till I came to our first track from Duck Bay to Jones's Island, where the boats lay, and where I

arrived at dusk, and informed Mr. Jones of the success of my journey. Next day our party went to the village. Mr. Jones, the carpenter, and myself went by the new road, as I wished them to give their opinions of what I thought our grand object, but I found our party more in pursuit of other amusements. We came to the village, when Mr. Murray and myself examined the channel that led to Duck Bay, and found it navigable for boats. On our return across Duck Bay the tide was flowing, and I asked Mr. Jones to go the shortest way through the bush to ascertain the meeting of the tides, and determine whether this would be a proper place to establish our works. Mr. Jones told me that he had had enough of it, and that I might go myself, which I did with the carpenter. We met at the boats—Mr. Jones talked of going over to the vessel in the morning at day light—I remonstrated with him, and stated that the bay seemed formed by Nature to answer all our wishes, though we knew very little of it at present, and the principal object now wanted was a stream of water: he said, that he would stay no longer, and we must find that next time we came, and that we had spent time enough here. In the morning the tide would not allow us to depart till eleven o'clock, I then proposed to take a walk round the west side of the bay towards the heads: Mr. Jones said he would wait no longer, so I went by myself, but not knowing what kind of travelling I should fall in with, and intending to meet the boats at the heads, and as I had an opportunity of seeing them pass I was to fire a signal to be taken on board, in case I could not make my way to the heads. I passed several large tracts of Hemp and rivulets of water, but my time would not admit of examining the source of them. I saw large quantities of Hemp all round that side the bay, and most of it from 7 to 10 feet long, in excellent soil. I found no difficulty in getting to the heads: it being ebb tide, and a hard sandy bottom, I reached the heads about four o'clock and made a fire on the hill; in an hour after, the boat arrived; it was

then proposed to encamp there for the night, and cross over to Port Williams in the morning. The only two young men we saw amongst the natives came with the boat, the rest were gone for more potatoes, but Mr. Jones would not wait their return. At day light the next morning, we launched the boats ; the two natives seemed much concerned on finding we would not wait the return of their companions with more potatoes, and bade us a very friendly adieu. We rowed most of the passage, and made the brig in the afternoon, all well. Mr. Murray and myself had a hope of taking the brig over, and acquiring more knowledge of Port Macquarie and the neighbourhood round, and Mr. Gordon was of the same opinion, but Mr. Jones over-ruled all, and determined to get under weigh next day for Sydney, which was done. We cleared the straits that night, and stood along the Eastern shore, but scarcely saw it, till we made Banks's Island, and after standing towards it from day light in the morning till one or two in the afternoon we came within about four miles of a fine harbour, and saw a large village distinctly : it was intended to go on shore but Mr. Jones declined, saying it would be only losing time. We stood along the land till we opened a large bay, saw several large columns of smoke, and stood under easy sail till day light next morning, when we found ourselves close in with Table Cape ; made sail and ran 7 or 8 miles into the bay, fired a gun, fires were lighted on shore, saw the natives, about ship again, and stood out of the bay. Mr. Murray having some knowledge of Table Cape stood close round it, saw large tribes of natives on shore, launching their canoes, hove the vessel to, the natives brought potatoes and mats for trade ; a spike nail would buy a hundred weight of potatoes, but I saw no Hemp. The natives gave me to understand, that they had plenty of that article on shore, and went for it ; we waited not for their return, but made sail and stood along the shore : the canoes continued coming off to us, trading as before. The natives in general all along, gave me to un-

derstand that they had abundance of Hemp on shore, which article (I am sorry to say) excited not the least attention of our party, for the grand object of our voyage seemed now to be totally forgotten: we had a fine breeze from the West and the vessel coasting along shore under easy sail, with smooth water, we had every opportunity of visiting every mile of the coast, and I had no doubt of our being able to have collected some tons of Hemp from the natives, which would have turned to good account, but Mr. Jones became impatient to get home. Mr. Murray and Mr. Gordon were of a different opinion, but yet they gave way to him, and we soon felt the effects of a stiff breeze, which drove us to the Northward and Eastward for several weeks. The vessel making great leeway, we never more saw the land. We might have made the North Cape, but all further attempts being declined, we reached Port Jackson after a cruize of twelve weeks, nearly as wise as we went. I think Port Macquarie so well suited, in general, to answer all our wishes, that I am positive much more might be done, than ever was expected before we sailed, from the general information we had received: but had I not been there, nothing would have been known of it: the short time I was permitted to stay was always in search of such objects as I knew would be requisite for an establishment, and every hour opened important objects to view; and though hurried away, with great reluctance, still I am well satisfied that great means may be applied to great advantages. Near the native village is a very high sandy hill commanding a view of low land, as far as the eye can reach, covered with Hemp, and so far as we could discern, there was no timber on the low land, except in patches and that of very thick brush. The natives here seemed to be only a few families detached from the main; they were remarkably kind to us, though I was informed they had been ill treated by some Europeans some time before. Mr. Murray had lived at Port Williams many months, and

was dependent on them for fish and potatoes; and they would have given him as many as he pleased; but Mr. Murray had never been into Port Macquarie. I have no doubt, that with proper treatment, they would be of great service to an Hemp establishment: they were very poor, but I saw great industry in their potatoe gardens which are kept remarkably clean. Fish and potatoes seemed to be their chief diet and dependance. Had we spent six days in Port Macquarie instead of three, I think many more favourable advantages would have presented themselves: such were the ideas I had formed of the situation on my departure, that I had arranged every point of an establishment independent of my further discoveries, and had not the least idea, but that it would have been cheerfully embraced on our return to Sydney. So strange, however, were the events of this expedition that of the principal persons selected for conducting and representing the voyage, one was wounded and could not go on shore, and the other would not see, or we saw and thought of things very differently. On our departure I had no particular appointment, neither on my return did I attempt to interfere with those who had a right to represent it. A few days after our return, I was asked what I had seen, and why we had done so little: I then represented Port Macquarie as a suitable place for a large establishment, and by that means I was informed that they had received different accounts from those who ought to have made them known. I gave such explanations as were requisite and referred to Mr. Murray and Officers of the vessel, whose opinion were nearly the same as my own and though we had not done what was expected I understood the business was to be proceeded in. The Phœnix being bound for England, Mr. Birnie, told me he wished to send a representation of the expedition to England, and requested me to send some musters home; but I was very ill prepared for such a request, for we had no means of performing any work when we sailed,.

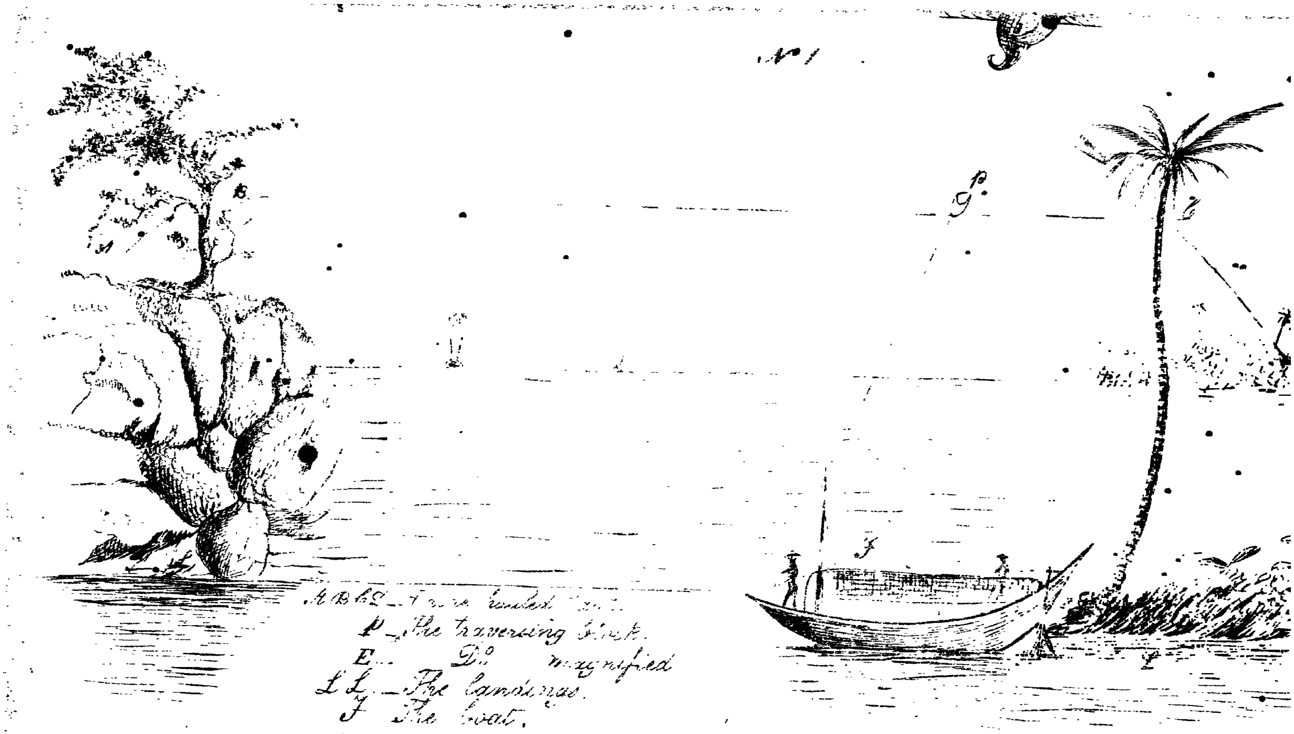
neither was it intended till we commenced on a large scale; since all parties were fully satisfied that my method of manufacturing was practicable, and to trifle with it would give others an opportunity, who were anxious to act on our principle. For these reasons I declined any experiment at New Zealand, except on a few bundles of raw plants, which I brought for curiosity, and to ascertain the effects of the voyage on them. In this case I told Mr. Birnie I would construct a small machine and clean the plants we had brought, and as I had some hopes and stood in need of assistance from the Governor, I therefore would request him to see it put in practice, which would remove all doubts of the business being brought to perfection, and secure the merits of my own labour. I completed my machine and presented a memorial to the Governor, representing my idea of the important value of the New Zealand Hemp: His Excellency was pleased to inspect the operation of cleaning and preparing the Hemp, and to express his approbation by a promise to give it every encouragement in his power to carry it into effect. Mr. Birnie, now signified his intention of postponing all further proceedings in the affair, till he had heard from England, his reason for so doing was owing to the representation Mr. Jones had given of it. I was very unwilling that Mr. Birnie should send those musters home (which he had) they being much damaged by having been brought over in the green leaf, and laid by for several weeks after our arrival. If I had known when I sailed to New Zealand, that it was intended to send samples to England, I would have taken care to provide myself with means to prepare such samples of Hemp and Cordage, as would have put them beyond the reach of doubt or prejudice. The musters which were sent were too trifling for inspection, and even the best of them were lost or made way with, when I packed up the case for England, and I then gave it as my opinion that if this were not properly explained at home, it would lead

judges of Hemp astray in their opinion of the New Zealand Hemp, which from the little information I have heard of its result, I think has been the case. I now shall produce such musters as will convey a just idea of the value of this hemp and represent from my own knowledge and experiences by what means and to what extent, it may be brought to manufacture articles of an excellent quality, which I can perform with less labour than any one in Europe. The arrangements which I conceived sufficient, for forming the first establishment at Port Macquarie, and which are on as small a scale as I could reduce them to, are these, viz. ,with 40 men and boys I am confident of producing on an average one ton of Hemp per day, including all the labour required to fit it for exportation. The machinery on this establishment would not exceed from £80 to £100. The party to be provided with six months' provisions, and means requisite for building habitations and store houses, the principal materials growing on the spot. The vessel to remain till our machinery commenced working, which may be completed in six or eight weeks from our landing, two or three boats to be left with the party, and from my present knowledge of Port Macquarie a decked boat of 15 or 20 tons, may be well employed. Large boilers must be provided (or more properly salt pans) of such dimensions as could be readily removed from one place to another, the sizes from 6 to 8 feet long and two deep would be sufficiently large for this purpose. I am well assured an establishment of one hundred Europeans may be employed at Port Macquarie, to much greater advantage than 40, with a proportionate increase of means and machinery, exclusive of extending establishments on other parts of the Coast, which, from general information, is practicable to a great extent. I am of opinion, the natives would perform the greater part of the labour, in collecting the Hemp. In this establishment, I have paid great attention to moderation, respecting the produce of the undertaking, and could represent

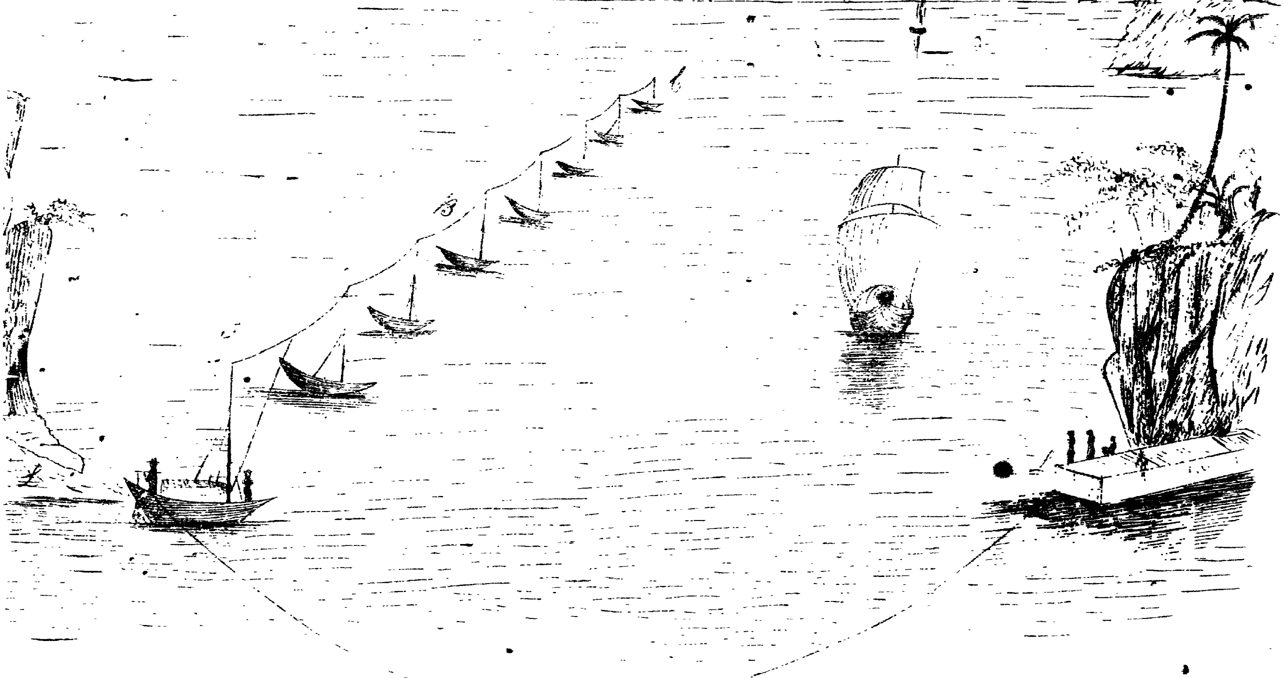
a number of advantages which I have reserved for practice, should I ever have the opportunity of performing them.

Exclusive of furnishing the British Market with Hemp, this Colony and others may be supplied with manufactured cordage and canvass, to great advantage, for the cheap production of the Hemp, would admit those articles to market at a moderate price. For manufacturing, the only articles wanted from England would be six sets of Hatchets, a few dozen of reeds for weaving duck and canvass (a set of Looms complete, would be far better and cheaper) four twine spinners, tacks of small sizes, and a few dozen of wheel bands, the whole cost of which would not exceed £100.

The following experiments will give a just idea to what extent this Hemp may be cultivated, exclusive of its natural production. I cut from one Tuft or Stool, 80 blades of Hemp, which did not occupy more than four feet of ground in circumference, and when brought to Sydney seven of those blades produced a pound of net Hemp of eight feet long, and the whole of them would have produced the same, had they not been damaged on the voyage. This pound of Hemp was cleaned in five minutes, in presence of the Governor. One slip or plant transplanted from the Governor's Garden, in June 1813, was cut three times in less than two years, and these I divided into nine slips, the whole of these plants producing young leaves an inch long in seven days. I endeavoured to ascertain the proper age and seasons for cutting this plant, but I find it may be cut all the year round, with very little difference in the quality of the Hemp, and I am positive that before all the Hemp in the neighbourhood of Port Macquarie could be gathered and cleaned, the first cut would be fit for cutting again and produce better Hemp. There are several species of the plant, some producing plants ten feet high, and others not exceeding three feet, which latter produce the finest Hemp.


No 1
P — The traversing stick.
E — Do magnified
LL — The lamdinas.
F The boat.

№ 2



B B – The [illegible] of suspension
b b – The [illegible]

L L – The [illegible]

Suggestions for improving the Ferries of Bengal. *By* J. McCosh, M. D. *Assistant Surgeon,* 31*st N. I.*

(Presented to the Society.)

Cawnpore, 23*rd Nov.* 1842.

In a country like Bengal, intersected by innumerable rivers, unfordable, and without bridges, one would naturally expect to find the public Ferries in the highest state of perfection, and every facility afforded to the multitudes traversing the high ways, of crossing them with safety, and dispatch. Nevertheless, in no part of the world are the Ferry boats more rudely constructed, more clumsily managed, more dilatory in their transits, or more dangerous to the passengers. There is no sufficient reason, why these things should be so. Bengal possesses every means of obtaining the finest boats, at the cheapest rate; the rivers themselves are admirably adapted to the most efficient mode of ferrying; and as those Ferries are all under the controul of Government, no difficulty would exist in superseding the primitive constructions now in use, and introducing any improved system that might be contemplated.

As no class is better fitted for appreciating the merits of any scheme for ferrying, than the Members of the Agricultural Society, many of whom are practical Agriculturalists in the daily habit of crossing Ferries, I trust to be excused for submitting the following plans for their consideration, and to be allowed to express my conviction, that they will be found to possess every qualification desirable. I pretend to no originality in their construction. While lately on furlough in Europe, I witnessed the first (No. 1) on the Rhone, and the second (No. 2) on the Rhine and the Po, and was so forcibly struck with their efficiency, and their adaptation to the rivers of India, as to give their mode of operation such a place in my Note book, as will, I hope, make them understood. By way of making the description more intelligible, I have drawn out the accompanying rough sketckes in pen and ink. (See Pl.)

No. 1.—This mode of ferrying is every where used upon the Rhone. A B C D is a stout rope, stretched between two fixed points on opposite banks, and so high as to admit of the boats of the river passing under it without lowering their masts; P is a block that traverses this rope, and to which the ferry boat is fastened; E the same block enlarged, with the sheaf of the block resting upon the rope; F the ferry boat in position: L L the two landing places. In crossing by this conveyance it is only necessary to fasten the rope to the mast or up river bow of the boat, push out into the stream and steer to the opposite side, in a line parallel to the main rope. The pressure of the current is the only moving power. Two men are enough for a boat of any dimensions. When cattle or heavy baggage is being transported, the ferry boat is some times made double, two boats being secured together. For all rivers under a quarter of a mile in breadth, no mode of conveyance could exceed this.

No. 2.—This plan is more particularly fitted for large rivers. C B F is a chain of canoes anchored at C, and connected by a stout rope passing over the mast heads. Their use is merely to support the rope, and keep it clear of the water, and so many buoys would answer the same purpose as well, and perhaps better. To the extreme canoe the ferry boat F single or double for greater security is made fast, and when pushed from the bank, and properly steered, the pressure of the current carries it in the arch of a circle F A L to the opposite shore. The chain of canoes requires no steering, the canoes moving in circles concentric with F A L and diminishing in regular ratio. It is necessary that the radius of the circle should not be less than ⅔ of the length of the chord, or in other words about ⅔ of the breadth of the river.

To both of these plans it may be objected, that the storms which frequent the river would speedily destroy them; but this objection is equally applicable to the ferry boats now in use: moreover, that the current is at certain seasons of the year,

No 2

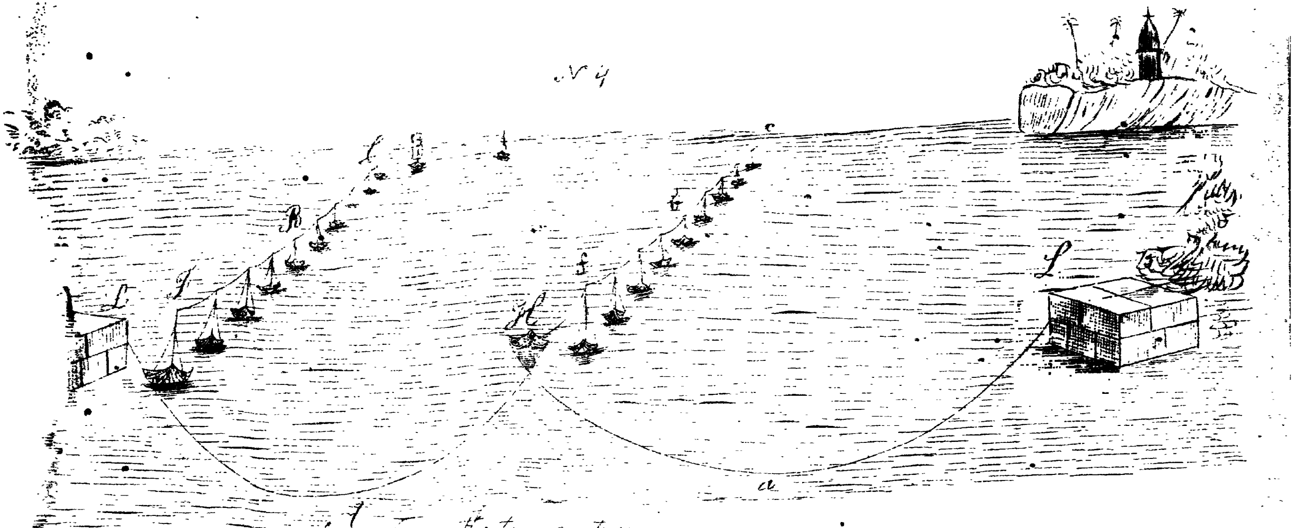
A. B. C. – Signal fires

H – The half way boat at anchor.

p p – [illegible] on the [illegible]

F – The ferry boat

No 4



C c. the two centres.
F B C G F b c. the chain of canoes.
L A H H a L. the two arches described
H. the halfway boat at anchor.
L L. the two landings.

and in certain places, so sluggish as not to suffice to give the boat steerage way : but in this predicament the worst inconvenience would merely be to have recourse to the old plan of the oar. At such seasons the river is least broad and least dangerous, and the disadvantages of the old system least felt. Further, it may be said, that neither of them is adapted to the great rivers, the Ganges, the Brahmapootra and the Indus, especially during the periodical inundation; that in the first, the cross rope would not be stretched so as to keep it clear of the water without breaking, and that in the second, the length of the chain of canoes and the consequent weight, would either break the connecting rope, or tear up the anchor.

To meet these extremes, I beg to submit the two following plans, Nos. 3 and 4, each being merely a compound of No. 1 and 2: I have never seen such compounds in use, nor even projected, but I am confident they are as practicable as the simple ones, and that both could be extended to an unlimited number so as to span a river four, six, or ten miles in breadth.

No. 3, is a compound of No. 1, with two ropes A B and B C, attached to the boat H anchored in the middle of the stream. P p are the two traversing blocks, with each its separate rope. F the ferry boat, and L L the two landings. When the boat F is pushed off from the shore, it is readily steered across to the half way boat H. Then casting off from P, and making fast to p, it is as easily steered across to the opposite shore.

No. 4 is a compound of No. 2. C c are the two centres from which the two chains of canoes are suspended, viz. C B F and c b f. L L the two points of landing. F the ferry boat, and H the half way boat anchored at the point where the two archs L A H and H a L intersect. The ferry boat F being pushed off is speedily carried round to H, there casting off from the chain C B F and making fast to the chain *c b f* the remaining half may be crossed with the same facility.

Any or all of these plans are particularly well adapted to a

tidal river. The difficulties that beset the present mode of ferrying in a rapid tide, are greatly in their favour. Nos. 1 and 3, act equally well in whatever way the tide sets, and the more rapid the tide, the speedier the transit. For all branches of the Ganges affected by the tide, and unfrequented by ships, this modification would answer extremely well. In the Hoogly, below Calcutta, Nos. 2 and 4 are more especially applicable, and would not incommode the shipping. The only precaution necessary would be to have a regular mooring so as to let the chain of canoes swing round at the turn of the tide.

Report on a specimen of the fleece of a Thibetan Sheep, forwarded from Assam by MAJOR F. JENKINS, *and examined by* MR. ROBERT SMITH.

I send herewith a skin of a Bootan (Tibetan) Sheep, a fair specimen of the common breed, of which the flocks are said to be very numerous. It is a great pity, that the jealousy of Chinese policy,* prevents our exchanging with these poor Highlanders, the products we and they could so readily give each other.

I have examined with much interest, the fleece of the Tibetan Sheep sent from Assam, by Lt. Scott, through the medium of Major F. Jenkins.

Its good qualities consist in the great purity of the color, the softness, density and uniformity of the fibre, and its perfect freedom from all burr, stained lock, and other impurity. Wool brought to market in that state would be pronounced decidedly "well handled," and would command immediate attention, relatively as to its quality.

Its defect, which, however, appears to attach to all indigenous, unimproved Wool of this country, consists in the straight, hairy, inelastic conformation of the fibre, in contra-

distinction to the spiral, elastic, woolly texture of the fibres of true wool, as will be observable on comparison with the sample No. 1, which is N. S. Wales' wool of superior quality. Yet, I have no doubt that the comparative softness of the Thibet wool, would cause it to work kindly on being spun into yarn, and that it would be useful for the finer kinds of blanketings, hosiery, napped cloths, and other goods, where a soft, full body is required to be given to moderately priced fabrics.

With respect to its commercial value in the London market, I should say that 9*d.* per lb. might be placed upon it, though I am quite unaware of the price required for it at the place of production. It is inferior in purity of color, and freedom from impurities, to the accompanying muster No. 2, which is Russian wool from the Don; which however, is of longer staple, but is the one that comes nearest to the Thibet specimen, on relative comparison. The value of the Russian sample is about 8*d.* per lb.

Reports by a Committee of the Society of Arts of London, on some specimens of Assam Caoutchouc forwarded by the Agricultural Society of India in 1838.

FIRST REPORT.*

Took into consideration a communication from the Agricultural and Horticultural Society of India, on sundry samples of Caoutchouc &c. referred to this Committee on the 8th May, 1839.

Read the communication and examined the specimens sent therewith.

* These reports were communicated in a letter lately received from Mr. W. A. Graham, Secretary to the Society of Arts, in which the discrepancy between the two reports is accounted for, by the second examinations having been made more than a year after the date of the first, and when the greater number of the samples were found adhering together in one mass, so that when separated, several of the labels were destroyed.—ED.

A. B. C. samples from Assam, sent to the Agricultural Society of Calcutta, by Captain Jenkins, the Resident.

A. B. C. Samples prepared by Lieut. Vetch in Assam.

——— Three samples from Assam, prepared by Assistant Surgeon Scott.

——— Five other samples from Assam, prepared by Assistant Surgeon Scott.

Mr. Price, broker, of the firm of Price and Gifford, attended, and stated that Valparaiso and Para are the chief places in South America whence caoutchouc is exported. The quality of that from Valparaiso is very bad; that from Para is principally in bottles, and partly in cakes and shoes. The former (the bottles) are of the best quality; the price varies from one to three shillings per lb. The Caoutchouc from Calcutta has hitherto been of very inferior quality, not bringing more than about three pence per lb. Of the samples now before the committee

A. of Captain Jenkins's is a good sample, better than any which has hitherto been seen from the East Indies.

B.———is a good sample, but not so pure as A.

C. Is a sample better than any except what comes from Para.

The price of the above would be from 1*s.* 6*d.* to 2*s.* per lb.

A. of Lieut. Vetch's samples, is more soft and sticky, and of inferior quality to A in Captain Jenkins's.

B. is also inferior to the corresponding mark of Captain Jenkins's.

C. is drossy, impure, varies colour and is inferior to the other two.

MR. K. M. SCOTT'S FIRST SAMPLES.

Of the three samples, two are thick, one is thin. They are all of the same quality, being very pure and good; if properly attended to, it might be a very valuable article.

OF MR. SCOTT'S SECOND SET OF SAMPLES.

No. 1.—Is clean, but soft and weak, might perhaps serve for dissolving.

No. 2.—Is dryer and better than No. 1, is tolerably tough, but much inferior to caoutchouc from Para.

No. 3.—Is clean, of good quality, and more elastic than the preceding, about equal to Captain Jenkins's A.

No. 6.—Is sticky and soft, and deficient in elasticity: it is, however, clean, and probably would be improved by drying.

No. 7.—Is clean, but soft and sticky, similar to No. 1.

SECOND REPORT.

Mr. Sevier having examined the samples, stated his opinion, that from the tacky, decomposed state of the samples, they are (with the exception of Nos. 2 and 3 prepared by Dr. Scott) only fit for destructive distillation, and are worth from 3*d* to 4*d* per lb. for that purpose.

They are not of sufficiently good quality to make a solution, as it would not dry.

No. 3.—Of Dr. Scott's is tolerably elastic, and might be used for making thread.

Superior specimens have been imported since these specimens were sent to the Society, and their present price in the market is from 6*d* to 8*d* per lb.

I believe that the Nos. 2 and 3 of Dr. Scott's, above mentioned, belong to the parcel of *three* samples mentioned in the first report.

A further delay has occurred in order that further information might be obtained, but I regret that I have not been able to collect any worth noting.

I shall be happy, however, to transmit to you, on a future occasion, any suggestions that may be made to our Society for improvements in the manufacture of caoutchouc in India

From the present bad state of the specimens of caoutchouc I fear that nothing can be done with them which would pro

duce a satisfactory result; but if the Agricultural Society should determine to send to the Society of Arts, specimens of more recent manufacture, they shall be promptly submitted, for examination and analysis to those gentlemen, who are most competent to form an opinion on the subject.

Observations on the soil of the District of Deebroghur, in Upper Assam, as admirably adapted for the growth of Europe Vegetables and Flowers. Details of the ravages of a particular kind of Cricket and Red Ant, with an account of the means which have been employed, without success, to destroy them. By Capt. PERCY ELD.

(Presented to the Society.)

I shall feel greatly obliged, if you will kindly forward me a small supply of English and other vegetable seeds. The soil at Deebroghur in Upper Assam, is peculiarly favorable to the different kinds of Europe vegetables and flower seeds, which thrive and attain a luxuriance of growth I have never seen surpassed, nor indeed equalled in India. My last year's crop of marrowfat peas, averaged *eleven* feet in height, and were superior in flavour to any I have tasted in the country. My mignonette ran to a perfect jungul of upwards of 4 feet in height. The hollyhock also thrives well, but I have at present in my garden exposed to all weather, a small plant of English broom, some four feet high and doing very well.

This I look upon as a great curiosity in so damp a climate. We have however an enemy to contend against, the mischief done by which, greatly retards the progress of our gardens, and is of a most annoying description,—I allude to a species of Cricket which lives under ground, they come out of their holes at night, and nip away right and left at the young plants, cutting them off close to the ground, apparently out of sheer wantonness. The mischief done by five or six of these little wretches in a single night, is almost inconceiv-

able. I have tried every thing with them, but the only thing I have found of any use is pouring water into their holes until they are obliged to come out for breath, but this is a very tedious business and could never answer in a garden of any extent. I shall therefore be very thankful if you can tell me of any preventive against them. Lime, salt, and tobacco waters I have tried, but without success.

There isalso a species of Ant of a bright shining red color, which does great injury to the potatoe, cabbages and peas, eating away at the stalks, and in the course of a few days entirely destroying them. These insects never appear above ground, but commence their operations in thousands round the roots, and so upwards through the inside of the stalks, eating away all the pith and softer parts, but leaving, the hard external shell. These are fully as annoying as, and infinitely more difficult to guard against, than, the Crickets, for the first intimation you ever get of their presence, is the sudden withering away of the luckless plants they have fixed upon, and these generally happen to be the finest and healthiest in the garden. Not a single cauliflower or cabbage of mine out of upwards of 400 plants last year, escaped their ravages; and what to do this season I know not, for every method I have tried to destroy them has utterly failed. If you could suggest any remedy I should feel greatly obliged.

Practical information on the best mode of cultivating Flax in Bengal. By M. Deneef, *Belgian Farmer.*

(Presented to the Society.)

In accordance with my promise, I send you as follows, a detailed report of my observations, since my arrival in India, on the cultivation of the Flax plant.

I will not enter on an explanation of the mode adopted in the cultivation of this plant in Europe, because nothing is easier than to do so theoretically, but will content myself with informing you, from my own practical experiments, of

'the means at our disposal in this country, which can readily be made available for the production of Flax and its seed.

1st.—Such portions of land as are annually renewed by the overflowing of the Ganges, or which are fresh and rich, are the best adapted for the cultivation of Flax.

2nd.—After the earth has been turned up twice or thrice with the Indian plough, it must be rolled; because without the aid of the roller the large clods cannot be reduced, and the land rendered fine enough to receive the seed. The employment of the roller, both before and after sowing, hardens the surface of the earth, by which the moisture of the soil is better preserved, and more sheltered from the heat of the sun. About, and near Calcutta, where manure can be obtained in great abundance for the trouble of collecting it, Flax may be produced of as good a quality as in any part of Europe. Manure is the mainspring of cultivation. It would certainly be better, if the earth be well manured, to sow first of all, either *Sunn* (Indian Hemp) or hemp, or rice, or any other rainy season crop, and when this has been reaped, then to sow the Flax. The tillage of the land by means of the spade (*Kodalee*) used by the natives, (a method which is far preferable to the labour of the plough) with a little manure and watering at proper seasons, will yield double the produce obtainable from land tilled without manure, and irrigation.

The mode of forming beds of six feet in width, with intervening furrows, in use in Zealand and in Belgium, is very inconvenient in India, because great care must be taken to preserve the moisture of the soil, and on the other part, for the purpose of weeding, they are unnecessary; when proper linseed, freed from mustard seed, is sown, I think that the Flax requires no weeding at all in India.

3d. The proper time to sow the Flax in India is from the beginning of October until the 20th of November, according to the state of the soil, the culture must be performed, if possible, some time before the sowing. The flax which I have

sown in November, was generally much finer and much longer than that sown in the former month, which I attributed to the greater fall of dew during the time it was growing. The quantity of country seed required to the Bengal beega is 20 seers, but only 15 seers of the foreign seed, because it is much smaller and produces larger stalks; the latter should be preferred, it is not only more productive in Flax, but, owing to the tenderness of its stalks, it can be dressed much more easily.

4. The Flax must be pulled up by the roots, before it is ripe, and while the outer bark is in a state of fusibility; this is easily known, by the lower part of the stalks becoming yellow; the fusion, or disappearing of the outer bark, is effected during the steeping, which may be fixed according to the temperature, say in December at six days, in January five, in February four days, and less time during the hot season; the steeping is made a day after the pulling, when the seed is separated, and then the stalks are loosely bound in small sheaves, in the same way as the *Sunn*; the Indians understand this business very well; but in taking the flax out of the water, it should be handled softly and with great care, on account of the tenderness of its fibres. When it is newly taken out, it should be left on the side of the steeping pit for four hours, or until the draining of its water has ceased; it is then spread out with the root-ends even, turned once, and when dry, it is fit for dressing or to be stapled.

5. To save the seed, the capsules, after they are separated from the stalks, should be put in heaps to ferment from 24 to 30 hours, and then dried slowly in the sun to acquire their ripeness.

6. When Flax is cultivated for the seed alone, the country Flax should be preferred; six seers per beega, are sufficient for the sowing; it should be sown very early in October, and taken up a little before perfect ripeness, by its roots, separately when it is mixed with mustard seed; the Flax seed being intended for the purpose of drying oil, is greatly in-

jured by being mixed with mustard seed, by which mixture its drying qualities are much deteriorated.

With regard to the dressing of the raw material, most of the coolies are now acquainted with the process, and I have not therefore alluded to it. Should you desire any further information on the subject I am ready to afford it.

Remarks on the Pueraria Tuberosa, a troublesome Plant in the Chittagong District. By JAMES DUNCAN, ESQ. M. D. *Civil Surgeon, Chittagong. With further observations thereon, by* N. WALLICH, ESQ. M. D., F. R. S.

(Presented to the Society.)

About three months ago, Dr. Duncan, Civil Surgeon at Chittagong, first wrote to me respecting a large twining plant, which I will at once introduce to the Meeting, by extracting the following passages from several communications concerning it, which I have received from that gentleman.

"Among the troublesome customers here, the lands are infested with a papilionaceous plant, which creeps out in all directions, at the rate of a foot a day, I believe, and underground it sends its roots deep and far away, with prodigious tubers, at about a yard from each other, on the same root; and these tubers must be ferreted out, before you can get rid of the nuisance. You probably know the plant I speak of. It has never been in flower since I came here (nine months ago,) although I have watched it, and I cannot tell you its name. Should it be new, I will send you a specimen of the plant and tuber, which is sometimes twice the size of the largest turnip at home. To eradicate this plant, I can call by no other name than a herculean work. If I could manage to take up an entire plant with every root, and every tuber, it would be a curiosity. But this is next to impossible, and I shall have to take it away by piecemeal. The plant seems to shed its leaves at this time (17th December,) as I could

not find any with leaves more luxuriant than the one I now send you. The tuber belonged to a plant which did not stretch its roots far into the ground. It is on high sandy soil, that the plant is so troublesome to ferret out. There its roots are much less, and instead of its tubers being very large, they are of a moderate size, and strung one after another, their distance upon each root being from one to two and three feet: the distance decreasing as you get from the stem of the plant."

Although I have received no specimens of the foliage of this remarkable plant, (excepting a single leaflet) or of any part of the fructification, yet I may venture to pronounce it to be either Roxburgh's Hedysarum tuberosum (Pueraria tuberosa of Decandolle, well figured in Dr. Wight's Icones, vol. 2, tab. 412, from Dr. Roxburgh's original drawing,) or at any rate some closely allied species. These tubers, or more properly tuberous enlargements of the subterranean stem, or perhaps of the root, attain a truly gigantic size. Dr. Duncan has favored me with several, both large and small. I will here give the weight and dimensions of the four largest I have got.

(a) Weight 33 seers (82 pounds); form nearly globular, that is, it measured in horizontal circumference 4 feet 8 inches, and in vertical 4 feet 4 inches, by 1 foot 3 inches in actual height.

(b) Weight 20 seers (50 pounds), form oblong, measuring in height 1 foot 4½ inches, in circumference 3 feet 7 inches.

(c) *(d)*. The two specimens which are placed on the Society's table, weigh 34 seers and 11¼ seers, respectively.

Allowance must be made in the above instances for some loss of weight by evaporation: and I dare say that still larger specimens may be found. Supposing the plant to be the true Roxburghian species, we possess it in the Company's Garden, since very many years, flowering and ripening its seeds annually. It is here a very large shrub, which twines over large trees, and produces the gigantic tubers I have

spoken of, in numbers a little below the surface of the ground, which is sometimes lifted up by them so as to point out where to dig for them. Some of the stems of our largest individual, which rise from one base, are as thick as an arm.

Dr. Roxburgh in describing the plant says, "it is a rare species, a native of the valleys far up among the mountains (of the Northern Circars). Root tuberous. very large; I think one of the largest I ever saw." (Flora Indica, vol. 3, p. 363.) He quotes *Kadsune* of Kaempfer's Icones, edited by Sir Jos. Banks, p. 2, tab. 41, which is *Katz*, vulgo *Kudsu*, *Kudsu Kádsura*, et *Kádsune* of Kaempfer's Amoen. Exot. p. 840, in which work it is said that the root is fleshy, a cubit long, and as thick as an arm. He considers the plant a *Phaseolus* (or bean); and in Thunberg's Flora Japanica, p. 366, it is placed among obscure plants under the name of a *Phaseolus* or *Dolichos*. In Drs. Wight and Arnott's Prodromus of the Flora of the Peninsula of India, the plant is suspected to be a *Desmodium*; and Dr. Arnott in his Pugillus Plantarum, in Nova Acta Academiæ Cæsareæ Naturæ Curiosorum, vol. 18, p. 330, declares it to belong to the tribe of *Hedysarea*. Dr. Hamilton found the plant in the forests of the province of Behar, and he calls it *Kennedia ? gummifera* (*Sâp Kechli*, Hind.) in his herbarium, where the locality of Mackipur is indicated; as also in his manuscript Catalogue No. 1609. Lastly, Kaempfer mentions that an esculent farina is produced from the root; and according to Roxburgh "the root peeled and bruised into a cataplasm, is employed by the natives of the mountains where it grows, to reduce swellings of the joints." The specific name given by Dr. Hamilton, indicates that it yields some gummous substance; in fact a considerable exudation of a transparent juice takes place on cutting into the new wood, which soon hardens into an adstringent gum.

In case the names which I have recorded really belong to one and the same plant, which admits of some doubt, it fol-

lows that its geographical extension is very considerable. I have had specimens from the neighbourhood of Sylhet, and I have myself found it at Hurdwar.

I ought to have mentioned that among the liberal supplies received since October from Dr. Duncan, there are likewise other specimens of different sizes, but much smaller than those I have described, and of various forms, mostly rounded or oval, weighing each a few seers, and in some instances two or three strung together in a series. I can scarcely consider these curious productions as real tubers; they seem to me to be simply tuber-like enlargements of the under-ground stem and branches, like those that are found in different other plants, of the same leguminous tribe to which ours belongs, as noticed by the late Professor Decandolle in his Memoir, p. 22. Their structure is very fleshy and fibrous. The connecting parts, as well as the stem above ground, consist of numerous ducts and woody fibres. A transverse section exhibits this very beautifully and instructively, forming distinct crowded rays, which diverge from the centre; a structure which is notoriously common among the twiners and climbers of tropical countries.

I doubt not that my zealous and active correspondent at Chittagong will hereafter furnish me with the local name, and any other details that my occur to him, for the information of the Society.

NOTES AND SELECTIONS.

GENERAL OBSERVATIONS ON THE OTAHEITE CANE, THE MORUS MULTICAULIS, ASSAM TEA, AND ON THE TRANSMISSION OF SEEDS FROM INDIA TO ENGLAND.

Lieut. Col. Sykes, in a letter to the address of the late Secretary, under date, India House, 31st July, 1842, writes,—

" You are evidently doing great good, and in the course of a few years, when you can get a large body of the native Zemindars enrolled as members, and made practically acquainted with the objects and advantages of the Society, there can be little doubt but that the condition, not only of the Zemindars themselves, but of their tenantry, will be very considerably ameliorated; and the phase of native society in the districts altered: The people only want instruction, for they are quite capable of applying knowledge usefully when they once get it.

The transmission to England, from India, of various seeds, particularly of the pine and cypress families, is already producing an effect upon plantations on the estates of the gentry; and the agriculturist is greedily profiting by the supply at the India House of the Cabool and Khelat Clover seeds; while shrubberies are boasting of new ornaments in new species of the beautiful Rhododendrum.

I was told the other day, that the Otaheite Sugar Cane had disappointed expectations in the amount of saccharine matter contained in the juice; which, although much more abundant than in the Canes of India (there are *three species* on the Bombay side) was nevertheless much more aqueous. I trust this is not the fact, and that labor, and zeal, and capital, have not been thrown away. With respect to the Assam Tea, from what I hear in Society, the varieties must have more aroma and be of a more delicate growth; or be manipulated better to win the gentry and middling classes to its permanent use; and as far as the common people are concerned, it ought to undersell the coarse black teas from China. I presume every successive year, will witness an improved management of it, and consequently make it progress in public favor.

I am glad to hear that the Morus Multicaulis is thriving. In Jamaica it has been introduced most successfully; and in a

recent conversation with a Gentleman connected with the Island; it would appear, that in many estates the owners have given up the cultivation of Sugar in despair, and have introduced the Silk worm; and as far as results go, the prospect of profit is quite commensurate with what sugar afforded."

SUCCESSFUL INTRODUCTION AT KAIRA, OF THE OLIVE TREE, AND THE MOMORDICA ELATERIUM.

Dr. Gibson, Superintendent of the Botanic Garden, at Daporee, in a note of the 7th August last, to the late Dr. Spry, writes—

"I observe in your June Proceedings, received yesterday, some remarks on the Olive. I beg to acquaint you, that since I first wrote to you on the subject, I have had several importations of Olive trees by the overland route, so that we have now 3 species, the Box-leaved the Broad-leaved, and the Redoute. Of the first and third we have many planted out, and at Kaira I have one flourishing tree 10 feet high and another 6 feet high. All are as healthy as possible. The soil at Dapoorie, a poor 2nd Black, does not suit this or indeed any other exotic tree well, that at Kaira, is very superior for trees, and I transfer most that are of value to it.

I have also the Momordica Elaterium which, after 2½ years very careful nursing, it having repeatedly died down, seems at last ripening its fruit, and I will take care to send some round so soon as it does so.

For the Olives we are indebted to the indefatigable exertions and kindness of Messrs. Loddiges and Co., and of Col. G. R. Jervis of the Bombay Engineers, for the seed of the Elaterium to Dr. C. Lush, who brought it with him overland. If the society please, I will have many layers or cuttings of the Olive made ready for distribution."

TREE PLANTATION IN THE N. W. PROVINCES OF INDIA.

In a communication dated Chaseside, Southgate, September 13th, 1842, to the late Secretary, MR. HENRY CARRE TUCKER, *a very zealous Member of the Society, writes as follows:—*

"It is a bad symptom of the state of our planting in the N. W. Provinces, that no one should come forward to claim a medal and Rs. 300. I feel convinced that Government, though right in abstract

theory, are practically wrong in not giving some support to tree planting. I have done all in my power, and cannot accuse myself in this matter. I hope Dr. Royle will write a work on the subject, proving its necessity, and naming the different more valuable trees, with their habits and uses. The subject of *artificial grasses*, as applicable to Indian agriculture, is one deserving the deepest attention.

What a pity it is, that the Merchants and Planters pay so little attention to these things, contenting themselves with pursuing the old beaten paths. The secret of the success of your Society, is, its keeping so constantly before the public. It always appears busy and active, whilst other Societies are only heard of at far distant intervals; and, however busy, are generally supposed to be asleep, from no one hearing what they are about.

Have you ever thought of a *vernacular* work on gardening and agriculture? If simple and practical, it might be of much use; and Government would probably take it up for the use of their schools. A vernacular "Handbook," adapted to natives, would be very valuable. Could you not perform this good work? Are there not also many indigenous products, which would be useful in the arts and commerce, if the natives only knew of them? A list of native medicines, substitutes for expensive European drugs, would be useful."

Further hints for increasing the quantity, and improving the quality of East India Sugar. Communicated by Mr. J. B. JONES, *late Planter, at Azimghur.*

(Presented to the Society.)

In my last paper on the manufature of sugar, I endeavored to show, that lime was an agent unfit for the purification of the cane juice in this country, and supported my opinion by a synopsis of Messrs. Terry and Parker's pamphlet on this subject. I now send an abridged copy of a paper, published by George Gwynne and James Young in 1838, in which the same opinion is maintained. Messrs. Gwynne and Young, however, have discovered an agent differing from that of Messrs. Terry and Parker, involving a good deal of trouble in the preparation, but if either one, or both of those agents, will, as I am inclined to think they are likely to do, defecate

the cane juice so effectually as to admit of its yielding a large quantity of sugar, and of a better quality than is now obtained, I shall consider my zeal for the benefit of this grand staple of India, well rewarded by witnessing the improvement.

"IMPROVEMENT IN THE MANUFACTURE OF SUGARS."

The process for which Messrs. Gwynne and Young obtained as patent, is performed by chemical agents, and partly by an improved filtering apparatus. As the juices of all saccharine vegetable matters contain tannic acid mucilage, acetic acid and other vegetable matters prejudicial to the sugar produced from them, and as raw sugars are also contaminated by them, and by the addition of lime and oxide of iron, the aim of the inventors has been:

1st. To render insoluble most of the above mentioned principles, and to neutralize the remainder without the employment of lime, potassa or soda as a temper.

2ndly. To remove the excess of the chemical agent which produces these effects, along with any lime or oxide of iron, which may be in solution.

3rdly, An improved filtering apparatus for separating insolubler bodies from the clear liquor (syrup) or juices.

Triacetate of protoxide of lead (subacetate of lead) is the best agent that can be employed to render insoluble the tannic acid, mucilage and gluten of unrefined sugars; it also from its alkalinity, answers very well to neutralize any acid or acids which may exist in them.

To prepare and use it, proceed as follows: In the manufactory prepare two vessels of copper or wood lined inside with sheet lead, of a concave bottom for the facility of stirring, and each large enough to contain 650 Gallons. A steam pipe of adequate bore to heat the vessels should be introduced in such a manner as not to interfere with the stirring. A guaging rod should be prepared to ascertain the contents of the vessels. Put into each 200 lbs. of acetate of protoxide of lead (sugar of lead), 800 lbs. of protoxide of lead (litharge) in fine powder, and as much water as will, with the water of the condensed steam, amount to 500 Gallons, let the steam be stirred down stirring constantly till the ebullition takes place. Then

'let it repose till the next day. After the clear solution is drawn off, the greater portion of the protoxide will be found unacted on: the excess is to be kept for use again. The next operation is to use along with the residue of the first experiment, 200lbs. of sugar of lead, and 250lbs of litharge, and the same quantity of water as before. This latter process should 'be repeated, again and again, until there is either a troublesome quantity of carbonate of protoxide of lead (white lead) accumulated in the bottom of the vessel, or the triacetate is imperfectly formed. When either of these two circumstances occur, acetic acid should be added until the insoluble matter is completely dissolved, this solution should now be employed instead of the acetate in making triacetate. When the triacetate is properly made it reacts upon turmeric paper as strongly as lime water, although it is prepared to use the triacetate in this diluted state, it can be prepared in a very concentrated state, if it be desirable to have it so. The following arrangement will answer the purpose. A copper vessel, of a suitable capacity, of a globular or oval form, and strong enough to resist the atmospheric pressure, should be prepared, heat can be employed either from a furnace, or jacket into which high pressure steam can be admitted. This vessel should have a man hole, to allow it to be cleaned when requisite, and a safety valve large enough to allow the escape of any steam the vessel is capable of generating. The valve is to be leaded wlth a weight which will barely keep it tight. Some of the deluted triacetate is to be let into this concentrator and heat is then to be applied. The valve keeps out air by remaining in its place. As soon as the steam gets some pressure the valve rises and allows it to escape, and as the evaporation proceeds more triacetate is to be admitted until the desired degree of concentration has been obtained. The evaporation should proceed so far as to cause precipitation in the fluid. By having a stop cock in the vessel the solution can be examined from time to time in order to guard against this effect. When duly concentrated, the solution may be drawn off in ground stoppered bottles and a fresh charge let in.

The greatest portion of the impurities of Raw Sugar, lies on the outside of the grain, and therefore will soonest be dissolved when water is added to the sugar. A thin solution of sugar, allows chemical

action to take place in a more energetic manner, than a solution of greater specific gravity, and if two equal portions of raw sugar liquor be taken, and an equal quantity of triacetate be added to each liquor, the one added when the liquor is brought to the boiling point, and the other in the cold state, stirring being kept up whilst this is doing, and that it is then brought to the boiling point, the latter liquor will prove much freer than the former, after filtration.

In operating on cane juice, &c. the necessary quantity of triacetate is to be applied to the juice, as it issues from the mill, and is to be gradually poured in, stirring well until the whole is added. Heat should not be applied until the triacetate is all in. When this is performed, the juice should be brought to the boiling point, and then filtered, instead of allowing the impurities to subside by repose. *In no case should lime water or temper be used,* as its effect is most injurious to the sugar. The quantity of triacetate to be employed will be governed entirely by the amount of impurities existing in the raw sugar cane juice, but in no case should more be added when precipitation ceases to take place in the juice, which will readily be judged of: 2½ Gallons imperial measure of the *diluted triacetate* is sufficient to render insoluble the impurities contained in a cwt. of Muscavado sugar of ordinary quality, sometimes less has been sufficient. A first trial should be made at the rate of 2 Gallons per cwt. When the liquor is filtered, a small portion should be put in a test tube, and a few drops of triacetate added to the same and well shaken, if after 2 or 3 minutes repose no opacity appears in the glass tube enough has been added, perhaps too much; if opacity however shows itself, it proves that the requisite quantity has not been added: a few trials will soon show the operator the quantity to be used. Two and half gallons of the triacetate will by no means precipitate the entire vegetable impurities from 1 cwt. of Molasses; but a greater quantity should not be used. In applying the triacetate to cane juice it is advisable to employ it, as long as the precipitate is formed. After the requisite quantity of triacetate has been applied to raw sugar, molasses, cane juice &c. filtration should take place, and the insoluble matter composed principally of gummate of oxide of lead should be preserved, and when heated to

redness will yield protoxide of lead, to be employed instead of litharge, in the making of triacetate.

The clean liquor or juice now contains such a quantity of salt or salts of protoxide of lead, that if these salts be not removed, the Sugar of such liquor or juice will be more injured, than if the triaceted had not been used. In other words, the grain suffers more injury from the presence of these salts of protoxide, than the mucilage, tannic acid, and gluten would have occasioned, had the triacetate not been employed. It is therefore absolutely necessary to remove these salts from the liquor or juice, otherwise the separation of tannic acid, mucilage, and gluten from unrefined sugars by the use of the triacetate, instead of being an improvement in the manufacture of sugars would be a positive injury. There are several acids, as the sulphuric, oxalic, hydrosulphuric (sulphuretted hydrogen) which form insoluble compounds with protoxide of lead. These agents will therefore get rid of the protoxide of lead from the liquor, but their employment is even more injurious to the grain, than the salts of the protoxide of lead which they are intended to remove: other chemical agents as the ferrocyanate of hydrogen (ferrocyanic acid) phosphate of lime (superphosphate of lime) hydrosulphate of ammonia, animal charcoal in fine powder &c. will remove the protoxide of lead; but we have found that there are objections to their employment unnecessary here to state. We prefer the diphosphate of lime (neutral phosphate of lime) or neutral solution of phosphoric acid and soda. To any quantity of animal charcoal in fine powder and burned to whiteness add half its weight of sulphuric acid (oil of vitriol) specific gravity 1.80. The bone ash (phosphate of lime) should have two and half times its weight of boiling water well diffused through it, and the sulphuric acid should have five times its weight of cold water added to it. When this is done the bone ash and the water should be added to the diluted acid and they should be well stirred together for 8 or 10 minutes, stirring should also occasionally be performed during twenty four hours, after which there should be five times the weight of the bone ash of boiling water added to the mixture well incorporated, and the whole thrown on a filter, the clear acid liquor to be retained. The insoluble matter left on the

filter is to be washed with water, and again filtered, until the entire acid liquor is obtained. All the different acid solutions are to be mixed together, and from them, the diphosphate or neutral solution is to be made. To form the diphosphate, a very thin cream of newly slaked lime is to be added to the acid solution, until the acid test paper, barely ceases to indicate acidity. More lime should not be employed than will just produce this effect, as otherwise the diphosphate will be seriously injured. During the time lime is being added, constant agitation should be employed. The precipate should be thrown on a filter to drain, and afterwards it should be submitted to hydraulic or other pressure, in order to force out as much water as possible. Heat should never be used for this purpose. The neutral solution may be made as follows: dissolve a quantity of common carbonate of soda in 15 or 20 times its weight of boiling water, and add it gradually to the above acid solution from bone ash, (stirring well) until the fluid is exactly neutral. The whole is to be thrown on a filter, the clear fluid is the neutral solution, what is retained on the filter is to be employed along with the bone ash in preparing a fresh acid solution. The diluted neutral solution should be evaporated almost to the crystalizing point.

Having detailed the directions required to make the agents, which will deprive the liquor of the salts of protoxide of lead, we will proceed to state a few observations concerning their employments. Either of these agents will remove every trace of the salts of the protoxide of lead from the sugar, together with any lime or oxide of iron which may be present. We hardly know which of them to recommend as preferable. The operator can choose which he likes, after being informed of the difference between them. The diphosphate is an insoluble body, more of it is therefore to be used than of the neutral solution. The neutral solution, although itself perfectly neutral to test paper, sets free a little acetic acid from the tendency of phosphoric acid to form a triphosphate of protoxide of lead; now the diphosphate produces no effect of this kind. Should the operator object to a very simple method of neutralizing the acetic acid produced in using the neutral solution, the diphosphate should be employed. We have mentioned that this latter body

should be submitted to pressure, in order to force out the water. When it is intended to be used, a quantity of it should be well worked with some of the liquor or juice containing the salts of the protoxide of lead, and passed through a very fine wire sieve, in order to separate any lumps which may have escaped the mixing up, it is then to be added to the cistern containing the clear liquor or juice in sufficient quantity, in order to remove all trace of the protoxide of lead (after its addition, the liquor should be well agitated for a few minutes). This is easily known by filtering the liquor or juice through blotting paper, or a little cotton in a funnel, taking a small portion of it in a test tube, and adding a few drops of hydrosulphate of ammonia; on shaking the tube, if there is the slightest portion of the protoxide of lead present, the liquor becomes quite dark in color. A quantity so minute as one quarter of an ounce in 112 lbs. of raw sugar, turns the liquor of an inky hue. As the bulk of the biphosphate is diminished, in proportion to the pressure to which it has been subjected, and as perhaps some persons might not press it at all, it may be as well to state, that three quarts of diphosphate simply drained on a blanket and not pressed, will generally be found sufficient to deprive the liquor, produced from 112 lbs. of Muscovado sugar, of all traces of protoxide of lead. The hydrosulphate of ammonia is only to be relied on. Any excess of diphosphate is perfectly harmless in the liquor or juice. About a quart of the neutral solution of phosphoric acid and soda, of such gravity as almost to crystalize in the cold, will generally be sufficient to remove the protoxide of lead from as much liquor as 112 lbs. of Muscovado sugar will make. It should be treated in the manner directed in using the diphosphate of lime, no more of the neutral solution should however be employed than will answer the desired end of removing the protoxide of lead. When the necessary quantity of either the neutral solution or the diphosphate has been employed, the liquor or juice should again be filtered. It would be judicious to have a jacket round the cistern into which the steam is let, in order to keep the liquor or juice as hot as possible; and if it has been the diphosphate which has been employed, the clear liquor or juice is to be immediately converted into sugar, in the usual manner employed, in the manufactory; if the neutral solution has been employed, it will be

advisable to neutralize the acetic acid, which has been set free from the boiling liquor or juice into sugar. The following method we recommend, as the best that can be employed, for neutralizing any acid or acids in saccharine matter. Let a wooden box, lined with lead, be made of the following size: eight feet long, six feet wide, three and half feet deep, a stop cock is to be put in the bottom to draw off the liquor; the bottom is to be covered with a piece of basket work, over which a stout blanket is to be placed. Fill the vessel to within 6 inches of the top, with sand prepared as follows: a quantity of sand of the size of coarse gunpowder is to be washed quite clean and put into a suitable vessel, to which heat can be applied (a heater or a cooler, or a vacuum pan sugar house is an excellent model) take a quantity of well washed chalk (in powder) or carbonate of lime, and mix it with a considerable portion of water, and add the same to the sand. Heat is to be applied and occasional stirring, when the water is entirely evaporated, the sand will be found covered with a white coating. The clear liquor or juice, in which the acetic acid has been set free, is to be allowed to percolate freely through the sand as prepared above; as soon as it becomes bright it is to be boiled in the usual manner as practised in the manufactory. A box of the above size will be found sufficient for a house working 10 tons per diem, and will only require a fresh coating when the former is dissolved away by the acetic acid. In applying the triacetate to any impure Sugars (as Muscovado Sugar) in the manufacture of which lime, or other temper has been employed, there remains a small portion of the vegetable principles which no excess of triacetate will remove *so long as the Sugar contains any lime.* As long as the sugar contains any trace whatever, of these vegetable principles, its crystalline power is injured. It is not judicious to remove the lime in the first instance, but we would recommend the "green syrups" of "raw sugars" (treated as before directed) to be mixed up every day, in the "blow up" or "clarifier," with proper proportions of raw sugar subjected to the same treatment, and this to be continued as long as refined sugar is produced. When the latter event occurs, the "green syrups" should be got rid of in the usual manner. By following this plan of working the "green syrups" over again with raw sugar daily used, a much greater weight of refined

sugar will be produced, than by any other method. In applying the triacetate to cane juice, beet root juice and the "green syrups" should never be mixed again with the triacetate, as there are no vegetable principles to be taken away. They may be either worked by themselves, or have some fresh juice or sugar added to them, we would however advise, that if at any time, spontaneous acidity has taken place in the syrups, they should be passed through the sand as before directed. Any refiner who is now using or wishes to use that process, known in London by the name of Derosne's process, may apply to the clear liquor or juice (prepared as we have directed,) By following our directions he will find that 1 cwt. of ground charcoal, will do as much duty as several cwts. are capable of performing, with raw liquor full of vegetable impurities, lime and oxide of iron, as it would be if clarified in the usual manner.

What we claim, as the first part of our invention, is the application of the different suitable bodies of which phosphoric, and hydrophosphoric acids are component parts; of these bodies we give the preference to diphosphate of lime and neutral solution of phosphoric acid and soda in the manufacture of sugar. When the salts of the oxide of lead hydrated (precipitated) oxide of lead or albumate of oxide of lead are employed as above described. And further when other bodies, such as sulphate of acidulated, ferrocyanuret of calcyum, (prussiate of lime) oxalic acid, sulphuric acid, binoxalate of potash, chromate of potash &c. are used for precipitating the oxide of lead, we claim the neutralizing the excess of such bodies together with the acid of the salts of lead set free by the percolation through suitable insoluble materials, such as carbonate of lime, carbonate of magnesia, coarse grained charcoals &c. as above described, or by diacitate or triacetate of oxide of lead. Sugar refiners, though familiar with filtration on a large scale, appear to be unacquainted with the true principle of constructing filters, suitable for manufacturing purposes. It is generally held by them, that the more extended the surface, the greater is the filtering power, and to this object all their attention has been directed to improve the filters (Howard and Schroder's) now in general use in the country. The construction of Howard and Schroeder's being well known, it is unnecessary for us to notice them further, than observing that they

have no way either of increasing or diminishing the surface, they are suited for one kind of fluid alone, and even for that imperfectly.

On the Physical Properties of Soil, and on the Means of Investigating them. By Professor SCHUBLER, *of the University of Tübingen.*

(Continued from page 320.)

VI. *Property of the earths to absorb moisture from the atmosphere.*—Most of the earths which are commonly found in soils have the property in their dry state of absorbing moisture from the atmosphere, and this circumstance has a considerable influence on their different degrees of fertility.

The amount of this absorption may be found, by spreading a given quantity of the fine and previously well-dried earth on a plate and placing it under a glass receiver, having its inverted mouth closed underneath by immersion in water :—(see plate 3) *a b* is the earth lying on the plate, which rests on a stand ; *c d* is the vessel below, containing the water into which the receiver is inverted and thus closed from the external atmosphere. We allow the earths to remain under this receiver the same time respectively—12, 24, or 48 hours—in a mean temperature, varying from 59° to $65\frac{3}{4}$° F. and then weigh them again ; the increase of weight corresponds to the quantity of water absorbed. The following Table exhibits a statement of the results I obtained, in reference to this inquiry, with the usual earths ; the whole of the experiments were made in a temperature which varied between 59° and $65\frac{3}{4}$° F., and the amount of absorption is given in grains :—

Kinds of Earth.	1000 grains of Earth on a surface of 50 square inches, absorbed in—			
	12 Hours.	24 Hours.	48 Hours.	72 Hours.
	grains.	grains.	grains.	grains.
Siliceous sand..........	0	0	0	0
Calcareous sand........	2	3	3	3
Gypsum powder.........	1	1	1	1
Sandy Clay............	21	26	28	28
Loamy Clay............	25	30	34	35
Stiff Clay.............	30	36	40	41
Grey pure clay.........	37	42	48	49
Fine lime.............	26	31	35	35
Fine magnesia..........	69	76	80	82
Humus................	80	97	110	120
Garden-mould	35	45	50	52
Arable soil...........	16	22	23	23
Slaty marl........	24	29	32	33

General remarks.—1. Excepting the siliceous sand, all kinds of soil have the property of absorbing moisture from the atmosphere; the slaty marl, which, in regard to consistency and power of containing water more nearly approaches the sand, distinguishes itself more favourably than them in this respect; the absorption is seen to be generally the strongest in the clay-soils, especially when they contain humus.

2. Humus, of all the simpler constituents of soil, shows the greatest power of absorption: in this respect, however, the kinds of humus themselves furnish marked differences; the pure vegetable dried humic acid simply obtained from turf, in extended experiments made by myself, absorbed moisture from the air far less easily than that prepared from animal manure.

3. The absorption is always the greatest at first; the earths always absorb less in proportion the more they gradually become saturated with moisture, and they generally attain that point after a few days; if exposed to the sun-light, a portion of the absorbed moisture becomes again vaporized; in nature, a daily periodical change in this respect appears to take place, which must have a beneficial effect upon vegetation: the earths absorb moisture at

night which they partially give off again during the course of the day.

4. Fertile arable soils generally possess a great capability of absorption; still we must not conclude at once from the power of absorption alone which a soil may manifest, as to its fertility, since even clay soils without any humus absorb considerable moisture from the air; in the above experiments the pure sterile clay absorbed, in 12 hours, 37 grains of moisture, and consequently more than a very fertile garden-mould, which in the same time had absorbed only 35 grains. The assumption of Davy,* that this capacity of absorption possessed by a soil was to be received as a conclusive proof of its fertility, is liable, therefore, to many exceptions: and, if applied without modification, might easily mislead.

VII. *Property of earths to absorb oxygen gas from the atmosphere.*—The earths possess the remarkable property of absorbing oxygen gas from the atmospheric air, a phenomenon pointed out many years ago by Alexander von Humboldt;† this fact has indeed been subsequently called in question by some philosophers, but a more recent and extensive series of observations which I have myself made on this subject, and communicated in the eighth volume, pages 141, &c., of the new series of Schweigger's 'Journal of Chemistry,' shows that this property of the earths is confirmed almost without an exception, provided they be employed for this purpose in a moist state; the capability, therefore, of the earths to absorb moisture from the atmosphere appears to be of great importance, in dry seasons, as a preparation for this further process of absorbing oxygen, which we have now to examine.

In order to examine this property, introduce determinate quantities of the several earths, about 200 grains of each, in their moistened state into glass vessels (flasks) of equal size, and containing each about three or four cubic-inches of atmospheric air; make them air-tight by means of stoppers, surrounded at the edge with resinous cement; and, after several days have elapsed, test this included air for the quantity of oxygen it may contain by means

* Davy's 'Agricultural Chemistry,' 4to. 1813, pages 159, 160.

† Gilbert's 'Annals of Philosophy,' vol. i. p. 512?

of an accurate eudiometer, and thus ascertain the amount of oxygen gas absorbed, by the diminution which is found to have resulted in the proportion of that gas contained in the remaining air. The following table contains the results I obtained from my experiments on this point with the several earths; the experiments were made in glass vessels of 15 cubic-inches' contents, and with 1000 grains, in each case, of the several earths in a moderately moistened state, and in a temperature varying from 59° to 65¾° F.; excepting in the case of magnesia, of which, on account of its levity, only half that quantity was taken; the air remaining was afterwards analyzed by the voltaic eudiometer, and from the volume of the air absorbed its quantity was calculated by weight; for the sake of comparison, other earths of the same kind were likewise exposed in a state of perfect dryness.

Kinds of Earth.	Absorbed in the dry state	In the wet state. Absorption in 30 days, by 1000 grains of Earth, from 15 Cubic Inches of Atmospheric Air containing 21 per cent. of Oxygen.		
		Per cent.	Cubic inches.	Grains.
Siliceous sand......	0	1.6	0.24	0.10
Calcareous sand.. ..	0	5.6	0.84	0.35
Gypsum powder.. ..	0	2.7	0.40	0.17
Sandy clay....... ..	0	9.3	1.39	0.59
Loamy clay....... ..	0	11.0	1.65	0.70
Stiff clay, or brick-earth	0	13.6	2.04	0.86
Grey pure clay.. ..	0	15.3	2.29	0.97
Fine Lime....	0	10.8	1.62	0.69
Magnesia..........	0	17.0	2.66	1.08
Humus.............	0	20.3	3.04	1.29
Garden-mould......	0	18.0	2.60	1.10
Arable soil....... ..	0	16.2	2.43	1.03
Slaty Marl...	0	11.0	1.65	0.70

General remarks, with further experiments on this property.—All the earths lose on drying the property of absorbing oxygen from the air, but regain it in the same proportions as before on being moistened; if covered about a quarter of an inch deep with water in the closed vessel, the absorption takes place in the same manner; water alone, however, in the same quantity, and in the same vessels, ab-

sorbs only a very small portion per cent. in the same time, a clear proof that it is the earths themselves which induce this process in a different proportion.

2. Humus, of all the ordinary earths, exhibits the greatest degree of absorption of oxygen; the clays approach nearly to it; sand shows the least; fertile earths rich in humus absorb in general more than others which are poorer in humus and clay; the included air standing over them becomes at last so poor in oxygen that lights would become extinguished, and animals die in it.

3. In the mode of absorption, there is an essential difference between humus and the inorganic earths; humus combines partly with the oxyen in a strictly chemical sense, and assumes a state of higher oxygenation, in consequence of which there is formed also some carbonic acid; the inorganic earths, on the contray, absorb the oxygen gas without intimate combination; if dried in a higher temperature than from 167° to 189½° F., the oxygen escapes again, but they re-absorb it on being moistened; this experiment may therefore be many times repeated with the same earth.

4. In the case of earths which are frozen, or covered with a surface of ice, no absorption of oxygen takes place, any more than in the case of dry earths; in a moderately warm temperature, varying between 59° and 65¾° F., the earths absorb in a given time more oxygen than in a temperature only a few degrees above the freezing-point.

5. When any fertile soils are entirely covered with water, and exposed at a warm season to the influence of sun light, confervæ begin usually to form very soon on their surface, what has been called the green matter of Priestley (*Protococcus viridis*, Agardh, and *Priestleya botryoides*, Meyen); as soon as these are formed, oxygen is developed through the influence of the sun-light on this vegetable matter; when this experiment is made in close vessels, a distinct increase is perceived in the air standing over the water: the oxygen contained in it was increased in some of my experiments to 25 and 27 per cent., though the atmospheric air of the vessels at the beginning of the experiments had, as usual, only a proportion of 21 per cent. contained in it: this phenomenon agrees with many other observations in rendering it probable that a portion of the oxygen gas,

which during the warmer season suffers a diminution from so many processes of animal life and vegetation, is again compensated for by the action of sun-light on the products of the vegetable kingdom.

6. With regard to the reasons of this absorption of oxygen gas, they are partly founded on the general property of many porous bodies, in the damp state particularly, to absorb oxygen gas, without any direct chemical combination being formed by them with these bodies, as Ruhland has already accurately pointed out; and the principle of this absorption may partly be sought for in the proportion of humus and oxide of iron, which arable soils always contain in greater or less quantity; if the earths be previously burnt, and their portion of humus thus volatilized, while the oxide of iron is raised to a higher degree of oxidation, their power of absorption of oxygen becomes considerably diminished thereby, and in some instances disappears.

Phenomena explained by this absorption of oxygen gas.—Many phenomena prove that oxygen plays one of the most important parts in the economy of plants and animals; that in particular it is highly necessary in the germination of seeds and for the growth of plants; by loosening, digging, ploughing, and working the soil in any way, fresh layers of earth are brought successively into contact with the air, and fertilized, as it were, by the absorption of oxygen gas; from the above experiments, however, we infer that dryness influences this process unfavourably, and that it is therefore desirable to keep the soil in a moderately damp state, where that can be done.

2. Soil freshly brought up from below is generally found less fertile at first than it afterwards becomes when it has been exposed to the air and worked for a longer period; it seems by these means to become for the first time saturated with the quantity of oxygen essential to vegetation, while at the same time it becomes looser, and enriched with greater portions of humus from manures or decaying vegetables.

3. Clay-soils containing humus exhibit a particularly strong absorption of oxygen; they maintain themselves also for a longer time moist in dry weather than the sandy soils; properties, both of which must contribute to the fertility of these soils, especially when they are at the same time sufficiently free.

4. In subterraneous cavities excluded from the air, for instance in mines, there occurs not unfrequently a production of suffocating air, or choke-damp, as it is called, a phenomenon which appears to be often a consequence of this absorption of oxygen gas. The strata which enclose these places being frequently damp and clayey, are consequently capable of absorbing easily the oxygen gas from the air included within them, while the mephitic air is thus left in their recesses: if these strata contain also humus, or especially if carbon be found in them, as is the case with coal-blende, pit-coal, &c., they will form carbonic-acid gas; should decomposition of water take place, in consequence of metallic agency, as might so easily ensue with the sulphuretted pyrites, hydrogen gas is set at liberty, and an explosive atmosphere becomes thus easily formed.

5. In the clay-soils, nitric acid and the nitric salts are frequently formed; this occurs particularly during the artificial production of saltpetre and in the slow process of saltpetre-beds; and is also found to take place spontaneously here and there in the upper beds of soil, independently of the effect of artificial means; the absorption of oxygen gas induced by the soil, has probably a very considerable influence in these formations of nitric acid.

VIII. *Power of the Earths to retain Heat.*—The earths have the property of giving out again to surrounding bodies, in different lengths of time, the warmth communicated to them by the sun or the temperature of the atmosphere, and of retaining, therefore, such warmth within themselves for a longer or shorter space of time; this may be termed their power of retaining heat. It is not identical with specific heat, as it does not depend merely on that condition, but on the different capacity as well, which bodies possess of conducting heat. It is generally of a higher degree in proportion as the specific heat of a body is greater, and its power of conducting heat is less; these two properties combined will constitute the power of retaining heat.

We may adopt the following process for examining the power of retaining heat. We place equal quantities of the several earths in the dry state in large vessels of similar size, made of thin tin-plate, and having heated them to the same temperature, we observe, by means of a thermometer inserted in the middle of the mass, the time

they respectively require to cool down again to the original degree of temperature.

The several earths gave me the following differences in this respect. I heated 30 cubic inches of earth in each case up to $144\frac{1}{2}°$ F., and observed in a close room, having the temperature of $61\frac{1}{4}°$ F., the time which they respectively required to cool down to $70\frac{1}{4}°$ F.; and having set down the power of retaining heat in the case of calcareous sand, as equal, to 100, I reduced the remainder to this standard.

Kinds of Earth.	Power of retaining Heat, that of Calcareous Sands being = 100.0	Length of time required by 30 Cubic Inches of Earth to cool down from a temperature of $144\frac{1}{2}°$ to $70\frac{1}{4}°$ F. in a surrounding temperature of $61\frac{1}{4}°$.
Calcareous sand	100.0	in 3 hours, 30 min.
Siliceous sand	95.6	3 — 20 —
Gypsum powder	73.8	2 — 34 —
Sandy clay	76.9	2 — 41 —
Loamy clay	71.8	2 — 30 —
Stiff clay, or brick-earth	68.4	2 — 24 —
Grey pure clay	66.7	2 — 19 —
Fine lime	61.3	2 — 10 —
Humus	49.0	1 — 43 —
Fine magnesia	38.0	1 — 20 —
Garden-mould	64.8	2 — 16 —
Arable soil	70.1	2 — 27 —
Slaty marl	98.1	3 — 26 —

General Remarks.—1. The sands possess the greatest power of retaining heat when the earths are compared in equal quantities according to bulk; hence may be explained the dryness and heat of sandy districts in summer. Such districts, after sunset, must also maintain a higher temperature and for a longer time than others the soils of which possess a smaller power of retaining heat; and the slight power which sandy soils possess of containing water, in consequence of which but little warmth is abstracted from them by evaporation, must still further increase the degree of this property.

2. The slaty marl stands next to sands in regard to its power of retaining heat; and having at the same time a greater power of containing water, this circumstance must contribute to its fertility.

3. Among the ordinary constituents of soil, humus is that which

has the least power of retaining heat. Turf-soils, too, abounding in humus, grow warm but slowly, because they are endued with a very great power of containing water, and have, in the first place, to lose by evaporation a portion of this water contained in them.

4. The small power of retaining heat evinced by fine magnesia, prepared artificially, would seldom be the same as that which this earth would have as a mixed ingredient occurring naturally in soils, being usually found under such circumstances in a coarser form combined with other earths, as in sands and slaty marls, which possess a great power of retaining heat.

5. If we compare in the earths their power of retaining heat with their other physical properties, we shall find it to be most nearly in proportion to the weight of a determinate volume, that is, to the absolute weight; the greater mass an earth possesses in the same volume, the greater will be in general its power of retaining heat; we may, therefore, from the absolute weight of an earth, conclude, with a tolerable degree of probability, as to its greater or less power of retaining heat.

IX. *Warming of Soils by the Sun.*—The earths acquire heat from the sun in different proportions, and this property may exert a sensible influence on vegetation; upon it, therefore, may be founded, in some degree, the terms of a cold or hot soil. Land consisting of a light-coloured clay is warmed much more slowly and less powerfully by the sunlight, than one consisting of a dark-coloured dry soil; black garden-mould, rich in humus, becomes much warmer than meagre limestone or clay soils.

Very different external circumstances have an influence on the degree of warmth thus imparted, and these may be referred to the following four points:—1. The different colour of the surface of the earth; 2. The different degree of dampness in which the earth exposed to the sun's rays happens to be at the time; 3. The different component materials of the soil itself; and 4. The different angle at which the rays of the sun fall upon the soil: the influence of each of these circumstances requires to be examined.

Influence of the Colour of Soils on the warmth received by them from the Sun.—The influence of colour on the amount of heat may be observed easily in the following manner. We place thermometers in

the several soils, covering their bulbs about an eighth of an inch high with earth; in order to impart to each a different colour, we sprinkle them over respectively with differently coloured powders, leaving one of them exposed to the sunlight in its natural state and colour; for the communication of a black colour we may employ the soot obtained in the combustion of fir and resin (lamp-black); and for a white colour, fine magnesia; these are to be sprinkled over the surface of the soils by means of a fine lawn sieve.

When soils are under these circumstances, exposed to the heat of the sun, the black-coloured specimen always attains a considerably higher temperature than the naturally grey-coloured, and the latter again a higher one than the artificially white-coloured earth; the differences of temperature, in these cases, amounting usually to many degrees. In experiments, which I made on this subject, in the latter end of August, when the temperature of the air in the shade was 77° F., that of the surface of black-coloured sand rose from 77° to 123½° F.; that with the natural colour to 112½° F.; and that, on the contrary, with the white, to only 110° F. That is to say, while the warmth of the white-coloured sand rose 33° that of the black-coloured sand rose 46½°, or almost one-half more. The other earths exhibit corresponding differences. When the differently-coloured earths are even exposed for hours to the sun, they never attain the same degree of temperature, the lighter-coloured earths always remaining considerably cooler, while the black-colored acquire the greatest degree of heat.

Hence we see why the mere sprinkling of earths, ashes, or other powders of a dark colour on snow, accelerates its melting; and also why the dark colouring applied to inside and outside walls, or the naturally dark colour of many kinds of slate and slaty marl, has the effect of accelerating the ripening of fruit, as grapes, melons, &c., planted against them.

Influence of Moisture on the Warming of Soils.—The influence of the damp or dry state of soils on their acquisition of warmth is also considerable. If we expose earths of the same kind in a dry and wet state to the sun, the wet earth never attains the same degree of heat; its temperature, as long as it remains moist, being always many degrees less than it would acquire in a dry state. The depression

of temperature arising from the evaporation of their water, amounts to $11\frac{1}{4}°$ or $13\frac{1}{2}°$ F.

As long as the several earths, at the early part of the experiment, remain saturated with water, they exhibit but little difference in their power of acquiring heat, as they give off to the air, in this state of saturation with water, nearly equal quantities of vapour, in the same time; when they have become however in some measure dried in the air, their differences of temperature are found to become greater; light-coloured earths, with great powers of containing water acquire heat in consequence the most slowly, while dark-coloured sand and slates, on the contrary, with less powers of containing water, become warm on both these accounts in a quicker and more powerful manner.

Influence of the different Materials constituting Soil, on its acquisition of Heat.—The different ingredients which enter into the composition of soils have, in themselves, far less inflence on the capacity of soils to become warmed by the sun, than their colour and dryness. If we impart to earths artificially the same colour, and expose them in a similar state of dryness to the heat of the sun, the differences of temperature will be inconsiderable; so that the differences in this respect shown by the several earths in their natural state may be referred in a particular manner to these two leading circumstances, colour and dryness.

The following table contains the results of a series of experiments which I made on the different degrees in which earths acquire warmth from the sun in fine weather. I placed these earths in vessels of four square inches in surface and half an inch deep, and exposed them to the rays of the sun, coloured differently on the surface, and furnished with thermometers as already described; the observations were made in the latter part of August, and between 11 and 3 o'clock in the day, while the temperature of the air varied in the shade from $72\frac{1}{2}°$ to $77°$ F. As all the observations could not be made at once, the temperature which sand acquired on the same occasion was in each case taken as the standard of comparison, to which all the several observations have been reduced.

Kinds of Earth.	Mean of Highest Temperature of the upper surfaces of the Earths. (77° F. in the shade.) With a surface of the natural colour. Wet.	Dry.	With dry earth. With a white surface.	With a black surface.
			°	°
Siliceous Sand, bright yellowish-grey	99.1	112.6	109.9	123.6
Calcareous Sand, whitish-grey.	99.3	112.1	109.9	124.0
Gypsum, bright white-grey. . .	97.3	110.5	110.3	124.3
Sandy clay, yellowish.	98.2	111.4	108.3	121.6
Loamy clay, yellowish.	99.1	112.1	107.8	121.1
Stiff clay, or brk.earth, yellowish-grey	99.3	112.3	107.4	120.4
Fine bluish-grey clay.	99.5	113.0	106.3	120.0
Lime, white.	96.1	109.4	109.2	122.9
Magnesia, pure white.	95.2	108.7	108.7	121.3
Humus, brownish-black.	103.6	117.3	108.5	120.9
Garden-mould, blackish-grey.	99.5	113.5	108.3	122.5
Arable soil, grey.	97.7	111.7	107.6	122.0
Slaty marl, brownish-red.	101.8	115.3	108.3	123.4

Influence of the Inclination of the Ground on the amount of Warmth it acquires from the Sun.—The inclination of the ground towards the sun has a very considerable influence on the degree of warmth which the soil receives from its rays ; and the amount of warmth so produced is, under similar circumstances, always greater the more nearly the incidence of the ray approaches to a right angle, or 90 degrees, with the surface. If the actual increase of temperature produced by the rays of the sun beyond the temperature in the shade be between 45° and 63° as is often the case on clear summer days, this increase would be only half as great if the same light spread itself in a more slanting direction, over a surface twice as large. Hence it is sufficiently explained why even in our own climate the heat so frequently increases on the slopes of mountains and rocks, which have an inclination towards the south. When the sun is at an elevation of 60 degrees above the horizon, as is more or less the case towards noon in the middle of summer, the sun's rays fall on the slopes of mountains which are raised to an inclination of 30 degrees to the horizon, at a right angle ; but even in

the later months of summer the sun's rays frequently fall on them under a right angle, in cases where the slopes are yet steeper. Such declivities, particularly in our own geographical latitude (of Germany), are therefore peculiarly suited for the cultivation of plants which require a high temperature, such for instance as the vine.

If we compare accurately the power of the sun's rays to warm the soil with reference to the different seasons, we shall perceive more distinctly the influence of the different inclination of the ground towards the sun. I made some careful observations at Tübingen some years ago on this subject, the results of which I have arranged in the following table, in comparison with other observations which I had made previously at Geneva. Those observations, which are marked as having been made in fine weather, exhibit the mean highest temperature of an ordinary blackish-grey garden-mould, the temperature of which was observed on the south side of my house, in perfectly fine weather, between noon and one o'clock, whenever the weather happened to be perfectly fine at that part of the day. They are founded on the average of two years' observations: the bulb of the thermometer was covered only the twelfth of an inch high with earth, and its scale being of clear glass could contribute nothing to the elevation of temperature. Those figures in the table which refer to variable weather rest on observations made in the Botanic Garden at Geneva, in the year 1796: they contain the mean of the observations made every day, and not merely of those taken in fine weather. The elevation of temperature by the rays of the sun was therefore considerably less according to the average results of these observations, because the temperature of the upper surface of the earth on cloudy and rainy days often accords exactly with that of the air; but on the other hand, they give us more accurately the mean temperature of the ground at some depth.

Months.	In perfectly Fine Weather.			In Variable Weather: Mean of the whole Month.			
	Mean Temperature of the		Elevation of Temperature by the Sun's Rays in Degrees.	Mean Temperature.			
	Earth's Surface.	Air in the Shade.		Of the Earth's Surface at Noon	At three Inches below the Soil.	At four Feet below the Soil.	Of the Air in the Shade.
	°	°	°	°	°	°	°
January	54.1	24.6	29.5	43.0	38.5	39.4	38.2
February	86.2	43.0	43.2	45.7	39.8	38.6	36.8
March	99.5	46.6	52.9	53.2	43.2	38.1	38.1
April	121.6	61.7	59.9	78.9	60.7	48.3	50.1
May	131.2	67.3	63.9	80.1	64.4	54.6	55.9
June	139.8	75.2	64.6	89.1	73.6	61.5	60.9
July	146.3	81.3	65.0	93.4	73.3	64.9	63.2
August	130.1	68.9	61.2	96.0	76.9	68.6	65.8
September	119.8	68.0	51.8	82.8	70.2	66.1	62.4
October	80.8	42.8	38.0	59.8	54.4	58.8	51.8
November	72.7	40.1	32.6	47.3	43.7	49.0	41.6
December	59.2	35.6	23.6	35.3	33.3	39.0	32.1
Means	103.4	54.6	48.8	67.1	56.0	52.3	49.7

The highest temperature occasioned by the mere heat of the sun in the last two years, I observed on the 16th of June, 1828; the thermometer placed in the earth rose on that day at noon (the wind being west, the weather calm and perfectly fine, and the temperature of the air in the shade 78° F.) to 153½ F., and therefore 75½° higher than in the shade; it attained to nearly the same height on the 21st of June, on which day (with the temperature of the air 84½°, and a brisk east wind) it rose to 151¼°, and therefore 66° higher than in the shade; on other days I remarked further that when the weather was windy, while the temperature was the same in the shade, the temperature of the earth in the sun rose to a less elevation. The smallest difference I ever observed was on the 11th of January, 1829, when there was a brisk east wind; the temperature I obtained in shade on that day was, even at noon, 18° below the freezing-point, and the temperature of the surface of the earth in the sun rose only to 6¾° above the freezing-point. The highest temperature observed in the Botanic Garden at Geneva, in the years 1796 and 1797, in contact with the

surface of the earth, was 125°.4, which occurred on the 30th July 1797 :—

The highest, 3 inches deep below the surface 99°.5 July 26—29, 1797
The highest, 4 feet deep below the surface 73°.2 Aug. 1— 4 ,,
The lowest, 3 inches deep below the surface 23°.0 Dec. 12 ,,
The lowest 4 feet deep below the surface 35°.8 Jan. 26 to Feb. 13 ,,

The reason why the temperature observed at Geneva on the several days, in contact with the surface of the earth, rises to a less degree than at Tübingen, depends perhaps on the higher and probably more windy situation in which the thermometer was placed.—Geneva lying 1334 and Tübingen only 1076 English feet above the level of the sea ; nor is it unlikely that the bulb of the thermometer at Geneva was rather deeper in the earth, and in a situation proportionally less warm, namely, exposed to a northern aspect.

X. *Capacity of Soils to develope Heat within themselves on being moistened.*—It has already been mentioned (in a former part of my 'Agricultural Chemistry,') that powdery substances in general, and consequently the earths, possess the property of developing warmth when moistened while in a dry state ; and the results obtained on this subject with different bodies have been already communicated in a tabular form. We might suppose that this property in a case of the earths of the soil would be of important influence on the fertility of the land; this does not, however, appear to be the case. The earths develope warmth in this manner only when moistened after a previous state of perfect dryness ; but in nature, they are scarcely ever found in this perfectly dry condition ; and even when dried artificially, the development of heat in the case of ordinary earths is always very inconsiderable, amounting in general to only ½° or 1° F. : even with dry humic acid and artificial turf-earth, I could detect no greater a development of heat. The falling rain in warm seasons is many degrees colder than the lower stratum of the atmosphere and the upper surface of the earth, which it immediately moistens ; so that the earth in hot weather becomes rather cooled than otherwise by the rain ; this property of the earths at the utmost can therefore have, perhaps, the effect of diminishing the cooling of the earth by rain some half or whole degree of Fahrenheit, when the earth previ-

ously has been very dry: such a result can have but a very inconsiderable influence on vegetation; and in the colder seasons, when the earth is already damp, so slight a development of heat must be inappreciable.

XI. *Galvanic and Electrical Relations of the Earths.*—The electrical relations of bodies stand in such manifold relations to chemical and organic processes, that the properties of the earths, even in this respect, deserve consideration.

Electric Conducting Power.—The pure earths, as sand, lime, magnesia, gypsum, in their dry state, are non-conductors; the clays, on the contrary, are imperfect conductors; and the compound clayey earths are weak imperfect conductors. The presence of the moisture and of oxide of iron, which are found in all the clays, appears to be the principle of this phenomenon.

Power of exciting Electricity.—All the earths develope negative electricity when oblong dry pieces of them are scraped with a knife, and the resulting particles immediately received on the plate of an electrometer; the voltaic straw-stalk electrometer, by this manipulation, generally exhibits divergences of from 4 to 5 degrees: ice treated in the same manner gives positive electricity.

Polar-electric Relation.—When solutions of humus in alkalies and earths (the humic acid salts) are exposed to the current of the voltaic battery, decomposition immediately ensues; the humus, or peculiar humic acid, collects in brown flakes around the positive or zinc end of the apparatus, while the earths or alkalies (see plate, fig. 5) arrange themselves around the copper or negative end of the polar wire; humus, therefore, assumes in relation to the remaining earths the character of an acid, a circumstance which I pointed out, when I first made the experiment in the year 1817, in the fifth part of the Agricultural Journal of Hofwyl.

Influence of the simple Earths on the Germination of Seeds.—When we allow grain to germinate in the simpler earths, the young plants will, for some time, develope themselves as long as the earths possess the proper looseness and also remain sufficiently moist and at a proper temperature; conditions, which, according to what has been already said, on the capability of earths to become dry, must occur in different degrees; independently, also, of the moisture and warmth,

Plate Fig.

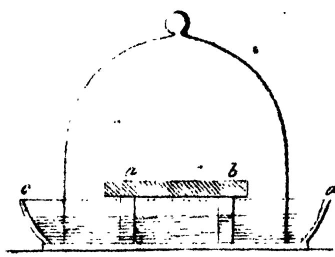
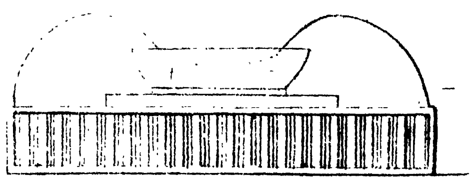


Fig.



the consistence of the earths has a great influence on the development of the germ; for if they have too great a consistence, the seeds lie in them without growing.

The several earths, in my investigations, exhibit the following differences in this respect:—

In moist siliceous and calcareous sand the grains germinated in summer in a few days, and developed themselves well for some time, but suffered on the approach of hot weather.

In gypsum powder, the young plants became developed but indifferently; from the alternation of moisture and dryness, a crust soon formed itself upon the surface, which the young plants could not break through without difficulty. As gypsum is in some degree soluble in water, this circumstance may easily contribute to the formation of the crust, since some portion of the gypsum becomes dissolved whenever moisture is applied, and again hardens on the evaporation of the water.

In sandy clay, no proper development took place; a radicle and plumule, about an eighth of an inch long, were indeed developed, but they soon died away before breaking through the clay, a crust having formed on the surface, through which the germinating seeds were unable to penetrate.

In the loamy and the stiff clay, the same phenomenon occurred, but in a more distinct manner.

In the pure clay, no development took place at all: even after fourteen days had elapsed, neither plumule nor radicle was to be seen, although during this period the due alternation of dryness and moisture had been properly maintained; in other respects, however, the seed-corn had not suffered by it, for when afterwards placed in a loose soil it grew very well. We thus see how it is that the seeds of many plants are capable of lying for a length of time undeveloped in the soil, and afterwards, at a later period, on being placed under more favourable external circumstances, of springing up.

In pure carbonate of lime, carbonate of magnesia, and slaty marl, as well as in pure humus, garden-mould, and arable-soil, the seeds germinated well; the young plants in warm weather developing themselves the most beautifully in the humus and in the carbonate

of magnesia, in consequence, probably, of the greater power of containing water which these earths possess.

(To be continued.)

"The New Manure."

The Nairnshire Mirror, August 12, 1842.

This new compost manure discovered by Mr. Daniell of Siverton, has created much public interest and should subsequent experience produce results in any way commensurate with those which have attended a four years' trial by the discoverer, on some exceedingly elevated and poor land in the neighbourhood of the city of Bath, cannot fail to produce the most extraordinary improvements in the agriculture of this country. When Mr. G. Webb Hall first announced his public address on this subject at the British Institution, he did so in the expectation and belief that he should be in a condition to make a full disclosure, not only of the elements of the manure, but of the particular substance of which it is compounded; circumstances, however, occurred to prevent Mr. Hall's carrying his intention fully into effect at that time. Mr. Daniell, and the scientific friends by whom his discovery has been investigated, are so thoroughly convinced of its importance and value, that it will fully bear out all the expectations that have been formed concerning it, that he, under their advice, has secured to himself the benefit of his discovery, not only in England but in France, America, Belgium, Prussia, and other parts of the world. Some delay unexpectedly occurred in securing two or three of these patents, and Mr. Hall was obliged to defer the complete disclosure until Saturday se'en night, when it has been unreservedly made to the inhabitants of Bristol and its neighbourhood.

Mr. Hall explained in his first address the principles of combustion by which the two substances essential to vegetable and the sources to vegetable developement—carbon and ammonia were generated. Mr. Hall observed that Mr. Daniell's discovery produced the same results; and he now states that the materials of combustion are used otherwise than by combustion to attain his end. Mr. Hall states the materials to be used to be five in number, viz.

wood, bituminous matter, soda, quicklime, and sulphur; and he thus describes the materials and mode of manufacture!

1st. Wood of every description. Ligneous matter is reduced to a powder by mechanical means, and forms the basis of the manure.

2nd. Bituminous matter of every kind is used either in a powdered state, or rendered soluble by caustic alkalies, and is then applied in various ways to saturate thoroughly the powdered wood.

3rd. Soda and quick lime are both put in requistion in forming the composition.

4th. Sulphur also forms an ingredient to a small extent in the composition.

These are the substances which have been compounded for the furtherance of those results which have attracted, and have been entitled to so large a portion of public attention. The principles upon which the invention rests are simple and philosophical, and the application of them can be extensively applied.

The discovery of Mr. Daniell has excited much interest in Bristol, Bath, and the adjoining counties, and the results of the experiments undertaken by his Grace the Duke of Richmond, Earl Spencer, Lord Ducie, Captain Scobell, R. N. and by Wm. Miles, Esq. M. P. and President of the Bristol Agricultural Association, to test the value of the manure on various description of soil, are most anxiously looked forward to. Should the invention ultimately justify the anticipations of those by whom it has been considered, there can be no doubt that it will confer a benefit on this country, the precise amount of which it would be difficult if not impossible to calculate.—*Bath Herald.*

On the collecting of Wood and other Vegetable Substances in distant Countries.

Xylography, although it will prove to be one of the important branches of vegetable physiology, has not been so generally attended to as it deserves. The apparent uniformity of European wood, and the few collections which were judiciously made in distant parts of the world, are some of the reasons of the slow progress hitherto made by Xylography. Most of the specimens of wood, until lately

brought to Europe, were square blocks for ornamenting chess-boards &c.; besides, such specimens were not of the least value to the botanist, as the species of plant to which they belonged was mostly unknown. These considerations struck me on the outset of my late travels; and I collected xylographic specimens, which are now in the collections of the British Museum, and those of St. Petersburg, Berlin, &c. The following instructions and observations may therefore be useful to travellers, or persons sojourning in distant countries. The pleasure of perambulating tropical forests is very great; not to mention the enjoyments of vision, the fragrance which we there meet with is beyond description. Far different is it from our climate, where most flowers have either no smell at all, or a very indifferent one. There, on the contrary, everything exhales perfumes the most refined. Not only have flowers a particular smell, but the fruit also,—even the leaves and the bark; and if (as I did often) you cut a tree with either axe or saw, perfumes will, in many cases, meet you, and the blackened instrument indicate that some particular sort of sap is contained in the vegetable limbs which you have injured. These qualities, as a matter of course, point out the properties and virtues of these plants, in many cases quite unknown; and it is Materia Medica as well, which will partially advance by the collecting of specimens, as recommended. I shall therefore first speak of collecting specimens of wood in general, and then advert to some especial rules relating to drugs, &c. The season, nay, the phase of the moon, in which a tree is cut in the tropics is, it seems, of some importance, concerning which Martius has made some remarkable observations in the Brazils. In this respect, the collector will have some scope for observation as to the rising of the sap in different climates; and his task will be, to note properly in which season (or even in which phase of the moon) a specimen has been procured. When a tree yields a particular sort of sap, like the Euphorbia phosphorea, the boring of such trees, for the sake of obtaining these substances, will be of consequence. For obtaining good specimens of wood, a healthy, fine, straight tree should be chosen; for such as are either hollow or decayed will not yield instructive specimens. The bigger a trunk, the more interesting its structure; but this certainly has its limits where trees of 7—10 feet diameter

may be at hand. The thickness, however, of such specimens is never a matter of consequence, except for the collector who wishes to provide several collections, because from 2 to 4 or 6 inches are sufficient to serve all the purposes of the observer. To give, however, to his specimens an equal thickness or length will certainly increase the value of the collection. The centre of a tree is a most important part of the specimens; and for obtaining this in trees where the whole segments are too large to carry, triangular parts of such segments may be chopped off with an axe or hatchet, by which means the centre, the whole length of the radii of the fibres, the bark, and adjacent parts will be obtained. Having just spoken of huge trees, it may be as well to observe that, on the other hand, there is no shrub so small of which the wood (stem) is not of importance; each specimen can be procured with a knife. There are many trees and shrubs abroad, under the bark of which, or on the surface of which, gums, resins, or other vegetable secretions, are to be met with. To collect such is of the greatest importance. In fact, there is no part of a plant, either different in its structural or periodical development, which is not interesting to the physiologist, and, if the plant has some internal qualities, to the chemist or pharmaceutist. Such are the roots, buds, leaves, flowers, fruits, &c. Of the collecting of specimens for the herbarium, we do not speak on the present occasion, but the following additional remarks may be of use to the collector of woods and other vegetable products. Specimens of woods should always be dried before they are packed up, for which an airy open place, not exposed to the rays of the sun, is the most appropriate. As the bark of some trees or shrubs separates from the wood, it is necessary to tie it to the specimens, or to fix it with some tacks, in order to avoid the mixing up different sorts. But all the foregoing instruction would not accomplish the perfect usefulness of specimens, if the species of plants to which they belong should not be known. There are few persons, however, who would be able, whilst travelling in distant countries, to determine at once the plants whose wood they collect. Corresponding numbers between the physiolgical specimens and the herbarium are very useful; still these also are liable to be rubbed off. I have therefore resorted during my travels to a most simple means of avoiding this

incovenience, by tying to every specimen of wood a few twigs of the plant, either in blossom or with fruit, or, in fact, as complete as I could find them. If I had gums or resin before me, I tied my little branches to the paper in which the former were contained. This, as everything else in collecting, must be done carefully, and never left until the collector has come home; but every branch should be tied to its specimen at the time of collecting. By the way in which this is done, the botanist in England will at once see whom he has to deal with, and value the collection of a man who has not neglected even such things as may appear trifles, but are in reality most essential. —*A Traveller.—Gardeners' Chronicle, July* 23, 1842.

To prepare Cuttings for India.

On reading *J. F. R.'s* very interesting account of the transmission of seeds and cuttings to and from India, in your last number, it occurred to me, that with a little gardening process, cuttings destined for either journey might be made more capable of sustaining their vegetative powers with greater certainty than if left to their natural course. This is the best time of the year to prune delicate and diseased fruit-trees, with a view to strengthen them or bring them to a healthy condition. The rationale of this is, that the eyes left are doubled in strength before the end of the growing season by the accumulation of the ascending sap, and are thus enabled to push with greater vigour next year. This is a good time, therefore, to apply this system to such shoots as are to be sent to India next October or November, by cutting off one-third or more in some cases, of their length. Cut the tips off half-way between two buds or joints, and the force of the ascending sap will nearly heal over the wound in two months. Now, if you ring the shoot where you intend it to be cut off, you will have all the strength and accumulation of this autumn's growth concentrated in the graft, as far as art can do it; and this, no doubt, will help, so far, their safe transmission. Besides, the store of vegetable matter, which will accumulate in the callosity over the ring, will be ready to break forth into roots as soon as the shoots are put into their natural element. Moreover, the partially healing over of the wounds, in this way, will be almost

sufficient to supersede the use of the wax altogether.—*D. Beaton.*—*Gardeners' Chronicle, August* 20, 1842.

Effects of Flour of Sulphur on Ants.

I have found Sulphur an effective remedy in the expulsion of Ants; but it does not appear to kill them, as I can find none dead, though I have minutely examined the soil. After its application, however, they invariably leave the spot, and are not again to be found in the neighbourhood of their late locality. It affects equally the black and the red Ants.—*A. P. V.*—*Ibid.*

Account of the Wool produced in Upper Scinde, Cutchee, and Beloochistan. By Lieut. POSTANS, *Pol. Agent, Upper Scinde.*

1. The following remarks are offered on the article of Wool as produced in Upper Scinde, Cutchee, and the higher country of Beeloochistan, being the result of enquiries on the subject.

2. Wool in Upper Scinde is not a mercantile commodity, nor does it value as such appear to be known; the quantity produced is moreover unimportant and used by the natives entirely for purposes of home consumption, as mussuds, kumlies, rugs, &c. the sheep appear to be of a poor and inferior description, and are seen only in small flocks, though the whole of this track of country would seem to be well adopted in forage for feeding large quantities—the inundations however would probably, for a certain period of the year, render the soil too damp for this animal.

3. In Cutchee the numerous large flocks of Doombah sheep which are met with, particularly during the cold season (zimistan) are principally those brought down by the Brahooee and other hill tribes for forage, and to avoid the inclement climate of the upper country. The flocks appertaining to the plains are not numerous, and the wool is used for the same purposes as in Upper Scinde before alluded to. The following statement from a Native chief in Cutchee, respecting this article may be relied upon, and it shews that the hill Beeloochees manufactured the wool and brought the articles for sale to the lower country, proving the want as a supply in the plains.

"From the time of Meer Nusseer Khan of Kelat until now, the Sarapan tribe of Brahooes manufactured rugs, mussuds, carpets, &c. and traded with them of the Jhahwar tribes, the Neecharee made woollen cloaks of various colours, ropes &c. and took them to Shikarpore, Khyrpore and Larkhana for sale, these are the articles made by the Brahooes of wool, and no one has yet purchased wool from Kutchee or taken it away for sale to various places. The Affghans in the neighbourhood of Candahar and Cabool make postiens, shawls, &c. of value, and sell them in these countries. In the Boogtie and Murree Hills on the Eastern side of Cutchee, the valleys afford pasture to considerable flocks of the Doombah sheep, the wool from these parts is manufactured by the Beeloochees themselves for their own use, the rest sold to the Hindoos in the small towns along the skirts of the hills, where it is used entirely for clothing or domestic purposes."

4. The mountainous division of Beloochistan, known as Jhahwar, is that in which wool is cultivated and forms the greater proportion of the property of the Jhahwar tribes of Brahooes. The flocks as described to me over the Jhahwar province in the districts of Kozdor-kal-wudd, Zharee, Zedee, Pandran,* &c. are extremely numerous, and if I am correctly informed, at least a lac of fleeces are produced annually therefrom. The following is a native statement on the subject.

"Wool in the province of Jhawar, is produced in great quantity; formerly the Brahooees made the white into mussuds,, and the black wool into Shawls, &c. some was also taken to Khelat, Cutchee, and other places for sale; but this is the 3rd or 4th year, that the Hindoos have become Traders in wool, they pay the Brahooees in advance to secure the fleeces and then send them to Bombay."

5. This information agrees with what I have elsewhere elicited, the sheep are sheared twice during ths year, at the Spring and Autumn (March and October) the wool being sold by the fleece at an average of about 6 per Rupee, each fleece weighing, it is said, something above ½ seer pucka-to one Bombay seer. The value of the article has of late become so well known to the Hindoo traders, that they

* The samples of the Wool from these countries will be forwarded hereafter.

secure it by advancing money to the owners, and this in a country where there is little or no security; at the above rate, the profits must be considerable, thus Khorassan wool under which denomination the above is, I believe, known in Bombay, appears to be worth about 140 to 145 Rupees per candy of 588lbs, the same quantity could be purchased in Beeloochistan for about Rupees 90, and the expence of transmission by way of Sonmeeanee and Kharachee does not greatly interfere with the profits.

6. Independent of Jhahwar, wool is produced in various other places, in Beeloochistan, in Sarawan, at Moostung, Khoran, Noskhey, &c., but not in the same quantity with that of the above district. In Affghanistan wool does not appear to be an article of Export, finding its own value in the country, where it is in constant use for articles of clothing &c. or of equal quality. Mekram furnishes a considerable supply of wool, but of an inferior quality to that from Beeloochistan.

7. From my enquiries I am led to believe, that Scinde (Upper or Lower) does not produce any of the wool at present exported to Bombay from the mouths of the Indus or Kurachee, as a mercantile commodity, nor is it to be found in that country in sufficient quantity to form an article of trade, tho' there is apparently no reason why it should not do so as in the neighbouring country of Cutchee. The same may be said of Cutch-Gundava, but Mekram and the hilly tracts of Beloochistan, furnish nearly all the article known in Bombay as Khorrassan and Mekram wool. That Central Asia generally will be found to be rich in this staple commodity, there can be no doubt, and as its value hereafter becomes known in these countries, it will doubtless be cultivated and become an important return in the trade of Bombay.—*Transactions of the Bombay Chamber of Commerce.*

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1842.

MINIMUM TEMPERATURE,

Observed at Sun rise.

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.650	80.5	78.0	76 0	S W.. ..	Rain Thundering,
2	.620	79.0	76.2	76 0	N.E. (high)	Drizzly Thunder, and
3	.618	80.2	79 5	77.4	S. E.	Cirro strati, [fresh gale
4	.665	81.0	79.7	78.0	E.........	Generally Clear,
5	.661	81.0	79.9	78.0	Calm, ...	Cumulo-strati,
6	.610	81.8	80.0	78 0	S. E. ...	Cloudy Thundering,
7	.626	79.6	78.0	76.0	Calm, ...	Cloudy,
8	.670	80.5	79.7	77 8	S. W.. ..	Clear,
9	.673	83.0	80 0	79 0	Calm, ...	Cirro Cumuli,
10	.750	79.5	76 3	74.1	Calm, ...	Cirro Cumuli,
11	,,	,,	,,	,,	,,	,,
12	,,	,,	,,	,,	,,	,,
13	.873	86.0	77 0	75 0	N. E	Cloudy,
14	.861	70.	74 8	73 0	N. E	Cirro-Cumuli,
15	.884	79.3	76 0	74.2	N. E... .	Cirro-strati,
16	.8 4	78 0	76 0	74 6	Calm, ...	Cirro strati,
17	.830	76.8	74.1	72.2	Calm, ...	To the N. Cirro-strati,
18	.825	79.4	76 8	74 1	N....	Cirro Cumuli,
19	.818	78.0	76 5	74 6	Calm, ...	Clear,
20	.838	78 0	76.6	74.0	Calm, ...	Clear.
21	.838	79.3	77.0	74.9	Calm, ...	Cirro-strati,
22	.850	79.0	77.0	75.0	N. E......	Cirro Cumuli,
23	.826	77 6	76 0	74 0	Calm, ...	Clear,
24	.842	78 0	75.2	73.8	Calm, ...	Cirro Cumuli,
25	.874	78.3	74.1	72.1	Calm, ...	Generally Clear,
26	.857	78.0	76.0	74 0	Calm, ...	Clear,
27	.834	78.5	76.0	74 0	N. W.....	Cloudy,
28	.822	77.5	75.2	73.0	Calm, ...	Cloudy,
29	.829	78.5	77.0	75 0	Calm.	Cirro strati,
30	.814	78.8	76.7	75 0	Calm, ...	Cloudy,
31	.829	76.8	74.2	72.6	Calm, ...	Cirro-strati,
Mean.	29.774	79 0	76.[illegible]	75.0		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1842.—(Continued.)

Days of the Month.	MAXIMUM PRESSURE. Observed at H 9. M. 50					
		Temperature.			Wind.	
	Barometer.	Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.681	83.9	86.5	82.0	N. E......	Cirro-strati,
2	.650	79.8	78.0	76.0	(high) N. E.	Raining,
3	.674	84.1	87.0	82.0	S. E... ..	Cumuli,
4	.722	84.6	86.6	82.1	S	Scattered Clouds,
5	.690	84.0	85.0	81.0	S.	Cumulo-strati,
6	.638	82.0	83.0	79.8	S. E... ..	Cloudy Distant (Thundering,)
7	.713	83.4	85.0	79.0	N. W... ..	Cirro stati,
8	.700	83.8	87.5	80.8	W........	Clear,
9	.753	84.0	8[illegible].0	81.0	S. W.. ..	Cumuli,
10	.838	83.2	86.0	81.8	S...	Cumuli,
11	,,	,,	,,	,,	,,	,,
12	,,	,,	,,	,,	,,	,,
13	.906	81.5	82.0	78.2	N. E.	Cloudy (Cirro Cumuli,)
14	.898	80.2	82.0	77.5	N. E.	Cumuli,
15	.881	80.8	80.0	76.5	N..... ..	Nimbi,
16	.906	81.9	83.7	78.7	S. E......	Cumulo-strati,
17	.874	79.3	80.7	76.8	N. E... ..	Cumuli,
18	.866	80.8	83.1	78.5	N. E.. ..	Cumuli,
19	.877	82.0	86.0	80.0	N. E.. ..	Cumuli,
20	.874	83.3	85.0	79.0	N...	Cumuli,
21	.877	83.0	87.0	81.0	N. E... ..	Cumuli,
22	.873	82.8	87.0	81.5	E.........	Cumuli,
23	.881	83.2	86.0	79.8	N. E... ..	Cumuli,
24	.913	82.6	85.2	78.5	E.........	Clear,
25	.914	82.0	85.5	78.0	N. E... ..	Cumuli,
26	.877	82.1	84.5	78.2	N. W.	Cirro Cumuli,
27	.854	80.5	80.5	76.0	N........	Cloudy and Haze,
28	.877	79.8	80.3	76.0	S....... ..	Nimbi,
29	.870	82.0	84.5	78.0	W. S. W..	Cumuli
30	.874	81.0	82.0	78.0	N W... ..	Cirro Cumuli,
31	.857	80.2	82.0	78.0	W...	Cumuli,
Mean.	29.821	82.1	84.1	79.1		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1842.—(Continued.)

OBSERVATIONS,

Made at Apparent Noon.

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.669	87.4	88.5	84.0	E.	Cirro-Cumuli
2	.622	80.0	77.5	76.0	(high)N. E.	Raining, and fresh gale,
3	.665	84.9	86.0	82.0	S. E... ..	Nimbi,
4	.721	86.0	87.2	82.0	S.	Cumulo-strati,
5	.669	85.8	88.0	83.3	S. E.. ..	Cumulo-strati
6	.610	82.0	82.2	79.7	S.	Nimbi
7	.698	85.0	87.7	80.1	W. S. W.	Cumuli,
8	.686	86.0	90.0	82.7	W..... ..	Clear,
9	.734	86.0	90.0	82.0	S. W	Cumuli,
10	.821	80.5	79.0	75.8	S.	Nimbi Interspersed,
11	,,	,,	,,	,,	,,	,,
12	,,	,,	,,	,,	,,	,,
13	.870	82.8	87.2	82.0	S. W... ..	Cumulo-strati,
14	.869	83.0	86.4	81.0	N....	Cumulo-strati,
15	.854	80.8	81.0	77.0	N.	Cloudy,
16	.869	82.7	84.2	79.0	N. [illegible].. ..	Cloudy,
17	.842	82.0	85.0	79.5	N. W.. ..	Cumuli,
18	.841	83.4	86.0	80.0	N...	Cumuli,
19	.853	84.4	86.7	79.2	N.	Cumuli,
20	.841	84.1	86.8	80.0	N.... ...	Cumuli,
21	.850	84.9	87.0	80.6	N. E.	Cumuli,
22	.838	84.5	88.0	81.2	N. W... ..	Cumuli,
23	.853	84.9	47.5	80.0	N.E.... ..	Cumuli,
24	.890	84.5	89.4	81.7	N. E.. ..	Cumuli,
25	.878	84.4	88.5	81.0	N...... ..	Cumuli,
26	.858	83.3	87.0	80.0	W..... .	Cumulo-strati,
27	.822	81.2	84.0	77.5	N.	Cirro strati,
28	.834	81.1	84.8	77.5	S.	Cirro-strati,
29	.838	84.0	88.0	80.0	W. S. W..	Cumuli,
30	.853	81.8	82.9	76.2	W..	Cirro Cumuli,
31	.829	82.2	85.0	79.0	W. S. W.	Cumuli,
Mean.	29.795	83.6	85.9	80.0		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1842.—*(Continued.)*

MAXIMUM TEMPERATURE

Observed at 2 H. 40 M.

Days of the Month.	Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Thermometer exposed to the Sun's rays.	Wind. Direction.	Aspect of the Sky.
	Inches.	o	o	o	o		
1	29.618	87.0	90.0	88.0	104.0	E.	Cirro Cumuli,
2	.597	80.5	80.0	78.0	82.5*	(high) E.	Nimbi,
3	.635	85.9	88.5	83.0	107.0	S.	Cloudy,
4	.665	86.1	87.2	82.0	93.0*	S.	Cloudy partially,
5	.613	86.8	89.0	82.8	109.0	S.	Cumulo-strati,
6	.581	83.9	85.3	81.9	100.0	S.	Cumuli,
7	.670	85.2	88.9	80.9	112.0	S. W.	Cumuli,
8	.650	86.2	90.0	82.6	111.0	W.	Cumuli,
9	.680	87.1	91.0	82.0	116.0	W.	Cumuli,
10	.793	84.4	88.0	82.0	111.0	S. W.	Cumulo-strati,
11	,,	,,	,,	,,	,,	,,	,,
12	,,	,,	,,	,,	,,	,,	,,
13	.840	81.5	79.0	76.0	82.5*	S.	Raining,
14	.810	88.0	87.0	80.6	100.0	N. E.	Cumulo-strati,
15	.786	82.8	87.0	80.2	120 0	E.	Cumuli,
16	.813	82 9	84 0	78.9	89.0*	N. W.	Nimbi,
17	.810	82.8	86.0	79.5	93.8*	N.	Cumulo-strati,
18	.794	82.5	87.5	80.9	109.0	N. W.	Cumuli
19	.817	84.0	88.5	80.7	104.0	N.	Cumuli,
20	.805	84.8	88.0	81.0	98.0	N.	Cumuli
21	.817	84.8	90.0	82.0	108.0	N. E.	Cumuli,
22	.806	84.9	90.2	82.0	113.0	N. W.	Cumuli,
23	.810	85.2	89.0	80.5	106.5	N.	Cumuli,
24	.857	84.2	88.5	80.2	102.0	N. E.	Cumuli,
25	.846	83.8	90.8	80.3	118.5	N.W.	Cumuli.
26	.797	83.5	88.0	80.2	108.0	S. E.	Cirro Cumuli,
27	.798	82.0	84.2	78.0	97.0*	W.S.W.	Cloudy,
28	.800	83.1	86.7	78.8	107.0	S. W.	Cirro strati,
29	.790	83.9	89.0	80.0	102.0	S. W.	Cirro strati,
30	.810	82.5	87.0	80.0	113.0	W.S.W.	Cirro Cumuli,
31	.789	83.1	88.5	80.9	110.0	N. W.	Cumuli,
Mean.	29.755	84.1	87.5	80.7	104.4		

N. B. The Asterisks in the column giving the temperature of the Sun's Rays

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1842.—(Continued.)

Days of the Month.	MINIMUM PRESSURE, Observed at 4 P. M.					
		Temperature.			Wind.	
	Barometer.	Of the Mercury.	Of the Air.	Of an Evaporating Surface.	Direction.	Aspect of the Sky.
	Inches.	o	o	o		
1	29.600	87.4	88.7	83.2	E.	Cloudy,
2	.589	81.0	79.1	77.0	(high) E..	Nimbi,
3	.634	84.7	86.0	81.0	S....	Cloudy,
4	.653	86.0	88.0	82.5	S..	Cumulo-strati,
5	.605	86.0	88.0	83.0	S..	Cloudy, partially,
6	.577	84.1	85.2	81.8	S....	Cumuli,
7	.665	85.2	88.5	81.7	W. S. W..	Cumuli,
8	.646	85.7	89.0	81.4	W..	Cumuli,
9	.680	87.0	90.0	82.0	S.	Cumuli,
10	.793	84.5	88.0	82.1	S. W.	Cumulo-strati,
11	,,	,,	,,	,,	,,	,,
12	,,	,,	,,	,,	,,	,,
13	.833	78.5	77.0	73.9	E..	Nimbi,
14	.806	83.0	86.0	80.0	N. E... ..	Cloudy,
15	.786	82.5	86.0	80.2	S..	Cirro-Cumuli,
16	.810	81.9	83.8	79.0	W.S. W...	Cirro-strati,
17	.806	82.8	85.0	79.2	N..	Cumuli,
18	.790	82.5	85.5	79.0	N.	Cumuli,
19	.814	83.0	87.0	80.2	N. W. ...	Cumuli,
20	.800	83.4	85.5	80.8	N..	Cumuli,
21	.817	84.5	88.6	81.7	N....	Cumuli,
22	.802	85.6	88.0	81.0	N....	Cumuli,
23	.800	85.2	88.0	80.0	N....	Cumuli,
24	.853	85.8	88.3	80.0	N. E.. ..	Cumuli,
25	.842	86.2	88.4	80.0	N..	Generally clear,
26	.794	84.8	88.0	81.0	N. E.. ..	Cumulo strati,
27	.798	81.5	82.6	76.0	W. S. W...	Cloudy,
28	.798	83.9	86.0	79.0	S. W.	Cumuli,
29	.782	83.9	88.0	79.0	W. S.W. ..	Cirro Cumuli,
30	.806	83.0	84.5	78.1	W. S. W...	Cloudy,
31	.781	82.8	88.0	81.0	W........	Cumuli,
Mean.	29.750	83.9	86.4	80.2		

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October 1842.—*(Concluded.)*

Days of the month.	OBSERVATIONS, Made at Sun set. Barometer.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of an Evaporating Surface.	Wind. Direction.	Aspect of the Sky.	Rain Gauges. Upper.	Rain Gauges. Lower.	Moon's Changes.	Moon's Horizontal Parallax at Noon
	Inches	o	o	o			Inches	Inches		
1	29.608	86.0	85.7	80.2	S. E.. ..	Very Cloudy,	1.34	1.37		61
2	.582	80.0	78.0	76.5	(high) E.	Nimbi,	0.54	0.59		61
3	.642	83.5	84.0	80.2	S. E.	Nimbi,	0.05	0.08		61
4	.660	85.2	86.0	81.0	S..... ..	Cirro-strati,			●	61
5	.610	84.7	84.5	80.2	S.	Cloudy,	0.22	0.27		60
6	.589	83.2	83.0	80.2	S...	Generally Clear,	0.25	0.31		59
7	.670	84.5	85.5	80.3	Calm, ..	Generally Clear,				59
8	.650	84.8	84.9	80.4	Calm, ..	Cirro strati,				58
9	.689	85.8	86.5	81.0	S. W.....	Cirro strati,	0.32	0.41		57
10	.807	83.8	84.0	80.5	S. W.....	Cirro strati,				56
11	"	"	"	"	"	"			☽	55
12	"	"	"	"	"	"	0.53	0.65		54
13	"	"	"	"	"	"				54
14	.810	82.0	83.5	79.0	N. E.. ..	Cloudy,				54
15	.794	82.0	83.0	78.2	Calm, ...	Cumulo strati,				54
16	.825	80.1	78.9	74.8	E..... ..	Cumulo strati,				54
17	.817	81.8	83.0	78.0	Calm, ..	Clear,				54
18	.797	82.4	84.0	78.5	N.... ..	Clear,				54
19	.821	82.8	84.0	79.0	N.... ..	Clear,			○	54
20	.809	83.5	85.0	80.0	Calm, ..	Clear,				54
21	.822	83.6	86.0	80.0	N.... ..	Clear,				55
22	.802	84.0	85.1	79.3	N.... ..	Clear,				56
23	.805	83.5	84.5	79.0	N.... ..	Generally Clear,				57
24	.858	84.0	85.0	79.0	Calm, ..	Clear,				57
25	.847	83.5	85.0	78.5	Calm, ..	Generally Clear,				58
26	.797	83.3	87.0	79.0	Calm ..	Cloudy,				58
27	.798	80.0	78.0	75.0	S. E.. ..	Drizzly,	0.06	0.12	☾	59
28	.809	82.4	84.0	78.4	S. W. ..	Cloudy,				59
29	.785	83.1	84.8	79.0	S. W. ..	Cloudy,	0.11	0.16		60
30	.806	81.0	80.5	88.0	Calm,....	Cloudy,				60
31	.789	81.8	83.8	79.0	Calm,....	Cloudy,				60
	29.753	83.0	83.1	79.0			3.42	3.96		

The Observations after Sunset are made at the Hon'ble Company's Dispensary.

Days of the month.	OBSERVATIONS, Made at 8 P. M. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.	OBSERVATIONS, Made at 10 P. M. Barometer.	Temperature. Of the Mercury.	Of the Air.	Of an Evaporating Surface.
	Inches	o	o	o	Inches	o	o	o
1	29.825	84.75	85.25	84.25	29.825	84.36	85.25	84.25
2	.775	82.0	81.5	80.5	.750	81.75	81.0	80.0
3	.886	83.25	84.0	83.75	.850	83.0	83.1	81.0
4	.900	85.0	84.0	83.75	.900	84.25	83.25	82.2
5	.796	85.0	84.25	84.0	.813	84.25	84.0	83.25
6	.750	83.0	83.5	81.5	.755	83.5	83.2	81.0
7	.900	84.25	84.0	83.5	.866	84.0	84.0	83.5
8	.850	85.5	85.0	84.75	.875	85.5	84.75	84.5
9	.830	84.0	85.0	[illegible]3.0	.890	83.0	84.5	82.5
10	30.100	84.0	83.75	83.25	30.100	84.0	83.5	83.0
11	.112	83.5	83.25	82.75	.150	83.25	83.0	82.5
12	.100	82.0	82.0	80.25	.100	81.5	81.5	80.0
13	.100	84.0	85.0	84.0	.100	84.0	84.5	84.0
14	.050	80.0	80.0	74.0	.100	80.0	80.0	74.0
15	.000	81.5	81.25	81.0	.050	81.0	81.0	79.5
16	.100	85.0	84.75	83.0	.100	85.0	84.5	83.0
17	.000	81.5	81.25	80.0	.000	81.25	81.0	80.0
18	.000	80.0	80.0	79.0	.000	80.0	80.0	79.0
19	.100	84.0	83.5	84.0	.100	83.75	83.5	83.5
20	.050	83.5	82.75	82.5	.050	83.0	82.5	82.25
21	.150	83.5	82.75	82.0	.150	83.6	83.6	82.0
22	.000	84.0	83.5	82.75	.000	84.0	83.5	82.75
23	.000	83.0	82.75	82.25	.050	82.25	82.0	81.5
24	.158	82.5	82.5	80.75	.158	82.0	82.0	81.0
25	.050	83.0	82.5	82.0	.050	83.0	82.25	82.0
26	.000	83.0	82.75	82.5	.050	83.0	82.5	81.5
27	.055	80.0	80.2	70.95	.055	79.5	80.0	79.0
28	.000	82.0	81.5	81.0	.000	82.0	81.0	81.0
29	.000	83.0	82.75	82.0	.050	82.0	81.75	81.0
30	.029	81.5	81.5	80.0	.075	81.2	81.5	80.0
31	.000	81.5	81.0	81.0	"	"	"	"

N. B. From a comparsion of the two Barometers, the Mercury in that at the Dispensary stands 1-10th of an inch higher than that in use at the Surveyor General's Office.

Monthly Proceedings of the Society.

The Hon'ble SIR J. P. GRANT, President, in the Chair.

(EIGHTY MEMBERS PRESENT.)

The Hon'ble the President commenced the business of the meeting, by stating, that the first subject which he had to bring to the notice of Members, was that relating to the election of a Secretary. Before entering however into the question, it was necessary that some resolution should be made, as to the reception, or otherwise, of the votes of absent members. In order that members might be the more prepared to arrive at some decision on this subject, he would beg to read the following "Brief Summary of the History of the Secretariat of the Society, for the last 14 years," which, he had directed to be prepared by the Deputy Secretary:

A Brief Summary of the History of the Secretariat of the Agricultural and Horticultural Society of India, for the last 14 *years.*

In December 1828, the Rev. Dr. Carey undertook the office of Honorary Secretary to the Society in the room of Mr. Barnett, deceased.

At an extraordinary meeting of the Society, held on the 15th April 1829, Dr. Carey intimated, that his distance from Calcutta, combined with other causes, prevented his paying sufficient attention to the duties of Honorary Secretary to the Society, and he therefore begged to resign the office. The resignation was accepted by the meeting, and an election of all the office bearers, by ballot, took place, at the same time, when Mr. C. K. Robison was chosen Honorary Secretary, in the room of the Rev. Dr. Carey.

Mr. Robison performed the duties of Honorary Secretary to the Society upwards of 5 years, till July 1834, when, at a meeting held on the 30th of that month, he tendered his resignation,—it was accepted, and Dr. Wallich was requested to undertake the duties of Secretary. Dr. Wallich expressed his readiness to act temporarily as Secretary to the Society.

At a meeting on 14th January 1835, Dr. Wallich requested to be relieved from the officiating Secretaryship; but at the earnest request of the members present, he consented to continue the per-

formance of the duties, till the arrival from the Cape of Good Hope of the President, Sir Edward Ryan.

At a meeting a few months subsequently, viz: on the 13th May 1835, Dr. Wallich again intimated his wish to be relieved from his duties as Secretary to the Society, as he was preparing for his approaching departure to Assam. It was recommended by the President, that Mr Bell should be requested to undertake those duties, and that gentleman having assented to this arrangement, it was resolved, that Mr. Bell be appointed officiating Secretary, during Dr. Wallich's absence, that the office be accordingly transferred to him forthwith; and that the thanks of the Society be offered to Mr. Bell for his kindness in undertaking those duties.

On the return of Dr. Wallich from Assam, he stated, at the meeting of 11th May 1836, that from the numerous other calls upon his time, he felt himself unequal to the task of resuming the labors of the Secretariat; and requested that the Society would allow him to resign. Dr. Wallich proposed, that the then officiating Secretary, Mr. Bell, be requested to continue his services. Mr. Bell stated his readiness to accept of the Secretaryship, on which the motion was put from the chair, and carried.

Mr. Bell continued as Honorary Secretary from that time till the 8th November 1837,—when, at at the meeting of that date, it was proposed by the President, "that in reference to the increasing correspondence and labours generally of the Secretary, a salary be awarded to Mr. Bell of 300 Rupees per month." The motion was brought forward at the next monthly meeting in December and carried unanimously. Mr. Bell acted as *paid* Secretary from Dec. 1837, till November 1838, the period of his demise.

At the meeting of the 12th December 1838, Messrs Wallich and Robison consented to officiate conjointly as Secretaries, until the anniversary election of office bearers in the following month.

In the meantime 5 candidates came forward for the vacant appointment of Secretary to the Society.

At the anniversary meeting held on the 9th January 1839, the election of office bearers took place. Sixty members, or thereabouts, were present on the occasion. The proceedings of that meeting make no mention of proxies either from Mofussil or Resi-

dent members of the Society. The writer of this believes, that votes were given, merely by the members who were present, in favour of the different candidates for the Secretaryship, as also for the other officers of the Society. On a scrutinity of the several votes it was found that Dr. Spry had the majority; he was accordingly elected Secretary, which office he held for nearly four years, till his demise, on the 5th September 1842.

It was then moved by Mr. Wale Byrne, and seconded by Mr. R. Scott Thompson.

"That the votes of absent members for the Secretaryship, tendered in writing, be accepted."

Mr. Hume addressed the meeting at some length against the immediate adoption of the motion made by Mr. Byrne, and urged several reasons for its postponement to another meeting.

Mr. W. P. Grant agreed in the desirableness of postponing the consideration of the motion alluded to, and begged to move the following amendment, which was seconded by Mr. Molloy.

"That a month's notice of a motion to the effect, that 'the votes of absent members for the secretaryship tendered in writing be accepted,'—be given, and the election of Secretary postponed till the general meeting in January."

The amendment was put to the vote and carried.

Mr. Byrne then gave notice accordingly.

It was then moved by Dr. Grant, "that this meeting do now adjourn till the next general meeting," which was put to the vote and carried.

OFFICE BEARERS AND STANDING COMMITTEES.

With reference to the resolution passed at a General Meeting of the Society on the 9th February 1842, "That it be a standing rule of this Society that the names of the various Office Bearers and Standing Committees be printed and distributed with the proceedings of the month of December of each year,"—they are now published for the information of members.

OFFICE BEARERS.

The Hon'ble Sir John Peter Grant. . *President.*

Dr. N. Wallich,. . . . .
Dr. John Grant,. . . . .
Rajah Radakhant Deb, ...
Dewan Ramcomul Sen, ... } *Vice Presidents.*

———————— *Secretary.*

A. H. Blechynden, ... *Deputy Secretary and Collector.*

STANDING COMMITTEES.

Sugar.—Messrs. G. U. Adam, G. F. Hodgkinson, John Allan and H. Piddington.

Cotton.—Messrs. Joseph Willis, Chas. Huffnagle, W. Earle, G. U. Adam and Robert Smith.

Silk, Hemp and Flax.—Messrs. R. Watson, J. Willis, C. K. Robison, G. T. Speed, H. Woollaston, G. H. Hodgkinson and Baboo Ramcomul Sein.

Coffee and Tobacco.—Drs. Wallich and Strong, and Thomas Leach.

Implements of Husbandry.—Major Forbes, Messrs. C. K. Robison and Chas. Huffnagle, Baboo Ramcomul Sein and Rajah Radhakant Deb, Bahadoor.

Caoutchouc & Oil Seeds.—Drs. Wallich and Corbyn, Baboo Ramcomul Sein, Rajah Radhakant Deb, Bahadoor, and Dr. Downes.

Improvement of Cattle.—Messrs. Chas. Huffnagle, C. Prinsep, W P. Grant, C. K. Robison, W. Storm and Dr. Wallich.

Nursery Committee.—Dr. Wallich, Messrs. Chas. Huffnagle and William Storm, Drs. Mouat and Downes.

Committee of Papers.—Drs. Grant and Mouat, Messrs. Bignel and Hume.

Finance Committee.—Messrs. Huffnagle, Staunton, Hume and Baboo Ramcomul Sein.

General Committee.—Dr. Strong, Baboo Rachamachub Banoorjee Messrs. Willis and W. Storm.